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BRIEFLY TOLD.

WE understand that Col. W. A. Stedman will receive the appointment of Manager and Engineer to the Laclede Gas Company, of St. Louis.

MR. LINDSLEY ON MUNICIPAL CONTROL AS AN ECONOMIC FACTOR.—Mr. Lindsley at the last meeting of the Western Association, we venture to assert, managed a clever surprise for the members in the way in which he discussed the subject of Municipal Control. The genial and clever gentleman from Cleveland was never a dreamer, and so it is not to be wondered at that he did not see fit to indulge in the dreams of a Bellamy, or the vaporings of a Rosewater. Mr. Lindsley preferred to talk of the day and its duties rather than to speculate upon the future and its possibilities, and so he afforded us an outline of how municipal control could be directed at the present time to saving the property of those obliged to make street excavations, and of those whose property is affected by the acts of others when making similar attacks on the roadbeds. Not only so, but such direction would also conduce to the comfort and better service of the people who are more or less dependent upon the corporations using the streets. He who has occasion to use the streets of New York as a footway will appreciate Mr. Lindsley's hints, and the Gas Companies, that have been made the victims of the incapacity of the city's sewer diggers and water-main layers, will also undoubtedly share in the appreciation. Mr. Lindsley's ideas respecting certain features of municipal control are timely and well put.

IN our current item columns we print a letter from Prof. Noyes, who seeks to set us right regarding certain analyses made by him of the gas supplied at divers times by the Citizens Fuel Gas Company, of Terre Haute, Ind. His letter is temperate and sincere beyond doubt; but we still submit that the greater the number of the analyses of this gas that Prof. Noyes furnishes—and we have every belief in his ability as a chemist and in his fairness as an umpire—the stronger is the proof afforded that the gas is fearfully and wonderfully made.

THE EQUITY GAS WORKS, BROOKLYN, E. D.—After many strange meanderings the charter granted some years ago to certain parties, giving them the right to build and operate a gas works in what is known as the Eastern District of the city of Brooklyn, has fallen into strong hands, that evidently intend to work it up as swiftly as is consistent with sound financial management and careful plant construction. We know that it is held by many that the Equity Gas Company is not likely to enter into the field of actual gas supply, and that the charter was held merely for "speculative purposes," but a visit to the site selected and purchased by the present holders of the charter will put an end to such beliefs—certainly in respect to the opinion that a works is not to go up. A comparatively short ride from any of the ferries between New York city and the Eastern District of Brooklyn brings the visitor past the old homestead of Peter Cooper, on Maspeth avenue, and at a short distance beyond and to the east appear the long stretches of meadowland, a portion of which is even now watered by the tides that ebb and flow through Newtown Creek and its feeders, each year growing less in volume, because of the changing conditions in commerce that oblige the followers of the latter to take hold of lands which not so many years ago were voted "waste." The Equity Company promoters have secured a wide plot of land, lying north and south of Maspeth avenue, with a front on the latter of 300 feet. A branch of Newtown Creek runs close to the property, which insures cheap and easy handling of materials. The property secured, a plan of works construction was arranged, which is at once harmonious and compact, the same being under the immediate charge of Chief Engineer W. P. Elliot and his first assistant, Mr. John M. Slaney, both of whom are well known in the fraternity. It was at first thought that the soundings for the nature of the

bottom would prove very discouraging, but the reality was far from bearing out the gloomy predictions. The case, however, was perhaps bad enough, as over 2,000 piles had to be driven in order that a good footing for the foundations could be obtained. A novelty in the borings was the promiscuous nature of the strata encountered—beach sand, red sand, clay, gravel and boulders were discovered, and at the western end of the property a strong flow of fairly potable water was struck at a depth of 43 feet. At the present time the massive stone foundations are virtually completed and the masonry on the buildings is well advanced, as is also the holder tank, 90 feet in diameter by 28 feet in depth, which is intended for the reception of a triple lift holder, to be furnished by Messrs. Deily & Fowler, of Philadelphia. All the mason work is in charge of Mr. W. C. Whyte. The main system of the Company, which provides for a leading main (down Maspeth avenue to Humboldt street) of 24 inches in diameter, from which two 20-inch branches are to be taken, so far laid out calls for a total length of pipe of 100 miles, and it is so arranged that not a single dead end is to be found in the system. Mr. John Fox will furnish the pipe and connections, and the work of main-laying has been let to Morris Fitzgerald. The buildings are laid out in the form of a double "L," and in the following sequence: From south to north line, first, the boiler room, 16 feet by 42 feet; next, the engine room, 32 feet by 42 feet; generator house, 65 feet by 42 feet, arranged for two sets, with sufficient space for betterments and enlargements; condenser room, 21½ feet by 42 feet; lime and oxide rooms, 18 by 42 feet. On east and west line, comes the purifying room, 112 feet by 39 feet: the meter room, 21 feet by 39 feet, to hold a station meter 14 feet square; and the office buildings, 19 feet by 39 feet. The height of the buildings is, roughly, 40 feet from piling, and brick will be used, relieved by light stone trimmings. The general works may be characterized as 16-inch, planned for future extensions. It should be said that the holder is to stand well on to the west line of the property. Carriageways and ready exits enable one to reach the different portions of the works without delay. Take it all-in-all, the works are very compactly arranged and their planning reflects great credit on the Company's engineer and his aides. The moving spirit in the financing of the Company is Mr. Henry E. Fanshawe, who will likely be a prominent figure in the gas business of the country ere the consolidation of the Brooklyn gas companies has been perfected; for it goes without saying that that must be the end of it all. When the Equity works are completed we expect to go into the details of their construction with some minuteness. In the meantime, however, it must be accepted now as an actual fact that the Company is far more than the myth, that some of the Brooklyn capitalists would fain have it.

AN ECHO FROM THE TRIP TO THE MAMMOTH CAVE.—Shortly after the cars were boarded to return to Louisville from the Western's notable excursion to the Mammoth Cave, the ladies of the party thought it but fitting that some formal acknowledgment be made by them to their hosts respecting the genuine enjoyment that marked the entire outing time. The result of this feminine determination was the following prettily worded document:

MAMMOTH CAVE, KY., May 23, 1891.

We, the ladies accompanying the members of the Western Gas Association, who have had the rare pleasure of a visit to the famous Mammoth Cave, of Kentucky, feeling that we are indebted for this most delightful entertainment to the Louisville Gas Company, and to Messrs. Dennis Long & Co., of Louisville, beg to tender to them our heartfelt thanks, and to assure them that we will ever remember with sincere pleasure their great courtesy, attention and generous hospitality.

We also feel under very many obligations to Mr. A. H. Barret and to Mr. A. F. Callahan, for their unremitting care of us, which has made this trip to the Mammoth cave, of good, old Kentucky, a bright and never-to-be-forgotten spot in our memory.

[Signed.]

Mrs. Bernice B. McIlhenny.	Mrs. O. K. Guldlin.
Mrs. C. V. Newman.	Miss Minnie Carroll.
Mrs. S. C. Schaffner.	Mrs. J. Gimper.
Mrs. B. A. Ward.	Mrs. Austin M. Smith.
Mrs. B. W. Perkins.	Mrs. Wm. Wallace.
Mrs. L. C. Davis.	Mrs. Edw. Ridgely.
Miss Sinklie Marshall.	Mrs. Wm. Tracy.
Mrs. H. T. Gerould.	Mrs. J. W. Butman.
Mrs. C. M. Keller.	Miss Mary B. Keller.
Mrs. W. B. Sellers.	Mrs. G. A. Yuille.
Mrs. C. M. Higgins.	Mrs. Thos. Turner.
Miss Turner.	Mrs. J. S. Zimmerman.

Mrs. Jerome Penn.

[A paper read before the Society of Gas Lighting.]

Coal Strikes and Petroleum Outlook.

BY MR. JAMES L. HALLETT.

Strikes in the coal regions have become of such frequent occurrence and the annoyance to gas companies so great, it is imperative that the gas engineer should provide, by every possible means, against contingencies which might place him in a bad light before the public whom he serves.

When we hear of the superintendent sitting up with his coal, sweeping the beams of the shed for refuse, traveling by midnight trains and on the verge of insanity, for fear that the supply might be exhausted before the arrival in port of the oft promised and long delayed cargo, and is driven finally to the necessity of using inferior coal, wood—in fact anything that can produce light, and all this at the expense of poor gas and financial loss, it is not strange that self interest and protection against future emergencies of like character should force a very large number of coal gas companies throughout the States to erect plants for water gas.

This is by no means an exaggeration, or an overdrawn picture of facts experienced by the gas fraternity in the last twelve months. The number of heads whitened, or may be lives shortened and sacrificed through over anxiety, will not be known till the roll call at the annual meeting of the American Gas Light Association!

That the gas manager has suffered mental and physical pain, and has been forced to substitute oil for coal wholly or in part, is not surprising. It is the natural outcome of repeated and prolonged strikes.

Coal strikes have had much to do in influencing the Massachusetts Legislature in its act repealing the ten per cent. carbonic oxide clause. It judged wisely that there should be no barrier on the statutes, which, under any circumstances, might prohibit the people from having light in their homes.

The introduction of so-called water gas into the towns and cities has grown to such large proportions, and the added adjunct of water gas plant to coal gas works is being so generally adopted with the larger gas companies, the increase in the output of oil must be very great, and with it the question must occur, "What effect will this increase have upon the production and cost of petroleum?"

There is reason to believe that it will effect neither one nor the other, owing to the unlimited supply.

The Eastern oil fields are reasonably defined and the present yield and stored product are largely in excess of the demand. Pipe lines are being extended and new lines built at great expense, showing the confidence oil companies have in their properties.

If, however, the charges should become exorbitant, or in the future should these wells become dry and new discoveries cease, there is, in the Western States and Territories, evidence of larger oil fields than have been found in the East. Wyoming, Colorado, Arizona, New Mexico have thousands of acres of unexplored mineral land, and yet sufficient coal and oil lands have been discovered to supply the world.

Railroads to the Gulf and water transportation as well could deliver both products, at low cost, to Atlantic coast cities.

A few items gathered from observation, and printed matter in this comparatively unknown oil district, may be interesting to those using petroleum in large quantities.

Petroleum was discovered in Colorado as long ago as 1861, but, owing to the few inhabitants, the demand was limited and little was done in refining the oil until seven years ago. The first large well was struck at Florence, in 1877, and yielded 80 barrels per day. From that date the production has been in advance of the consumption, and this town now supplies every gallon of refined oil used west of the Kansas and Nebraska line, including all States and Territories to the Pacific coast. The area of the oil belt extends from Wyoming, on the north, to New Mexico, on the south, a distance of more than 1,000 miles.

In different parts of the Grand Valley, in Colorado, oil oozes from the rocky cliffs, and on the plateau are long, black lines of asphaltum, with shale saturated with hydrocarbons to such a degree that they ignite with a match. I have extracted oil from pieces of the shale, with a yield equivalent to 40 gallons to the ton of rock. It would answer for gas purposes. From one pound of the shale we obtained $3\frac{85}{100}$ cubic feet of 24.6 candle power. The plateau rises abruptly 2,500 feet on the south border, and extends, to the north and west, 30 miles, and is nearly one solid mass of oil bearing rock. Here are found promising gas springs, indicating the presence of crude oil. While a pipe was being driven into one of the springs the gas caught fire and a column of flame, 60 feet in height and 12 feet in diameter, shot up into the heavens, illuminating the surrounding country for many miles and calcining the ground for several yards around the orifice.

There is a close chemical relation between natural gas, asphalt and

petroleum. They are all hydrocarbons, and where one of these substances is found, it is not unlikely to find the others. In the territory named they are all found with every indication of vast quantity of crude oil.

Crossing the Colorado line, we find, in Arizona and New Mexico, a valley, now narrowing, so far as external indications manifest, to a few rods, and again widening to many miles, a coal oil field, probably the largest in area on the continent. At certain points, notably at Wallace and at Gallup, on the line of the Atlantic and Pacific railway, some feeble attempts at exploration have been made.

Near Wallace the oil flows out of the earth in many places, at one point forming an immense bog, in which one would sink and suffocate quickly. In other points in the vicinity the oil drips constantly from the rocks overhanging ravines, and flows into the narrow valley, where it is, by a slow process of evaporation, converted into a species of asphaltum.

Near Coolidge, the oil belt widens, until its breadth, in many places, is not less than 50 miles. An old settler has located a claim, where from the drip of overhanging rocks he can catch a barrel of oil a day. On the Navajo Indian reservation there are places where the oil trickles from the rock and runs in streams for several hundred yards, until it gradually hardens into asphaltum.

From the earliest known period the Indians of New Mexico have known of this oil field, and have used it as a medicine or as a lubricant. They gather it by scooping out holes in the bogs or in the beds of the small rivulets. and from which they would gather up all that was required to supply their needs.

Here, then, is a known, but unexplored oil field, comprising hundreds and thousands of square miles, as yet wholly undeveloped, excepting in one small town of a few acres, which last year produced 400,000 barrels of crude oil.

The total area of the coal fields of Colorado is 18,100 square miles. The people at large know comparatively little of the hidden mineral wealth of the Western States and Territories. It is a country of wonderful natural resources. That there is oil and coal enough in the country to meet the demands of the gas engineer for centuries to come there can be no doubt. When necessity requires, capital will be directed to the mining, shipping and storing in the sheds and reservoirs in the East, of these essential commodities in the manufacture of gas. It is a vast reserve, which forever precludes of any shortage and can be drawn upon whenever necessity, from labor strikes or from any other cause, should demand.

[Official Report.—Revised by the Secretary.—Continued from Page 817.]

FOURTEENTH ANNUAL MEETING OF THE WESTERN GAS ASSOCIATION.

Held at the Galt House, Louisville, Ky., May 20, 21 and 22, 1891.

Second Day—Morning Session.

The Secretary read the following report of the Committee on Place of Meeting, which, on motion of Mr. Boardman, was received and the recommendation adopted:

Report of Committee on Place of Meeting.

Frederic Egner, *President Western Gas Association:* We, your committee for the selection of the place of meeting of this Association for next year, unanimously recommend that our fifteenth annual meeting be held in Detroit, Mich.

Isaac C. Baxter,
J. S. Ambrose,
R. H. Canby,
J. W. Stratton,
Irvin Butterworth,
} Committee.

Report of Nominating Committee.

Mr. Lansden—The Nominating Committe report as follows:

President—E. C. Cowdery, Milwaukee, Wis.

First Vice-President—B. E. Chollar, St. Louis, Mo.

Second Vice-President—E. H. Jenkins, Columbus, Ga.

Secretary and Treasurer—A. W. Littleton.

Board of Directors—W. H. Odiorne, Springfield, Ills.; K. M. Mitchell, St. Joseph, Mo.; I. C. Baxter, Detroit, Mich.; I. S. Post, Chattanooga, Tenn.; Jerome Penn, Washington Court House, O.; W. Wallace, Lafayette, Ind.; A. H. Barret, Louisville, Ky.; A. S. Miller, Omaha, Neb.; W. I. Johnson, Fort Smith, Ark.

Respectfully submitted,

T. G. Lansden,
P. Bauer,
Eugene Printz,
John Gimper,
Geo. A. Yuille,
} Committee.

The President—You have heard the report of the committee. What is your pleasure in the matter?

Mr. Gimper—I move the adoption of the report, and move that the ballot be cast by the chairman of that committee.

The motion was carried, and Mr. Lansden cast the ballot of the Association for the election of the nominees.

The President—Now that Mr. Cowdery is President, we would like to hear from him in response.

Mr. Cowdery—I believe the only speech customary at this time is to say, I thank you. I am deeply indebted to you for electing me to the first office at your disposal, and I hardly think I am entitled to it. I feel I have done as little as any member connected with the Association to advance its interests, either in talking or in writing. However, I accept the office with a great deal of pleasure, and I think that possibly by throwing all the work on the Secretary, your next may be a very creditable meeting. Possibly I, too, may get some of the credit and honor of the work. (Applause.)

The President—Mr. B. E. Chollar, the First Vice-President, is not here, having been detained by an accident at the works of which he is Superintendent. We all know that he will very much appreciate the honor. The Second Vice-President is Mr. E. H. Jenkins, of Columbus, Ga. We will hear from him.

Mr. Jenkins—The volume of air which has been coming over this window this morning has so stopped my service pipe that I am not in a condition to make a speech. I can only say I appreciate the honor you have done me, and will do everything I can to advance the interests of the Association.

The President—Mr. A. W. Littleton has been elected Secretary and Treasurer.

Mr. Littleton—I can only say, gentlemen, that I thank you for the election. It was entirely unexpected! (Laughter and applause.)

The President—If any of the gentlemen elected to the Board of Directors wish to say a word or two we would like to hear from them. I want to say to the newly elected Board that they must not suppose that the Board of Directors are mere figureheads. About six years ago I was elected a member of the Board of Directors, and at the first meeting I attended I inquired what my duties were. I was told that they would be only nominal, and that really I had nothing to do. I did not want to be a Director and not have a chance to direct something, and I said so. We got together, and the influence of that meeting was appreciated by the Association. Every member of the Board can do a great deal towards making the meetings of the Association a success; and so can each and every individual member. The more we do to lift the Association to a higher plane the better it will be for the members who belong to the Association. I hope the newly elected Board will not accept this as simply a sort of honorary position, or as a joke, but will attend to their duties faithfully, and help to make this the greatest Association in America.

Mr. Lansden—I move that the Secretary be instructed to send to this new Board of Directors copies of our Constitution and By-Laws, so as to enlighten them and impress upon them the fact that they have duties to attend to. (Adopted.)

The President—I also want to say a few words more to the newly elected officers. We had a joke about it awhile ago, but it is really no joke at all. There are duties which every member ought to attend to. These are not only to attend the meetings, but when they are at home they are to keep an eye on what the Association is doing, and if anything occurs to them which they think ought to be done, or that it would be a good thing to do, they should communicate with the Secretary, who will communicate with the rest of the officers, and so build up the Association. We can accomplish a great deal by united efforts. I had a very pretty speech all thought out this morning, but have forgotten it now. There is another matter which I think you are all interested in. Since I came here I have been frequently asked about our honored fellow member and ex-President, Mr. McMillin, who came very near getting an obituary notice at this meeting, but, thank God, he does not need it. I received a telegram from him last evening, which is characteristic of him. He says, "Hope you will have a good meeting. Wish I could be there. I rode down town in a carriage to-day. *Remain there all the week.*" We had an accident at the works with which I am connected, and he thought perhaps I might hurry away. He tells you all that he is getting well, and sends you his good wishes.

The Secretary—A despatch was sent yesterday to Mr. G. A. Hyde, of Cleveland. His son is very ill, and the Association thought it but kind to send an inquiry as to his condition. We have received this despatch in reply:

"The thoughtful inquiries of the Western Gas Association for my son

are gratefully appreciated. Though very ill there are some favorable symptoms.—G. A. HYDE, SR."

The President—I will here take opportunity to name the following Committee on Obituary: Messrs. John McIlhenny, W. H. Odiorne and C. M. Keller. They will report this afternoon. The Committee of Arrangements to take charge of the meeting next year at Detroit will be: Mr. Jerome Croul, of Detroit, Mich.; Isaac C. Baxter, of Detroit, Mich.; and W. H. Morgans, of Pontiac, Mich.

The Association here took a recess until 2 o'clock.

SECOND DAY—AFTERNOON SESSION.

The President—We will now listen to Mr. Cowdery, who has kindly volunteered to read the paper written by Mr. K. M. Mitchell, of St. Joseph, Mo., on the

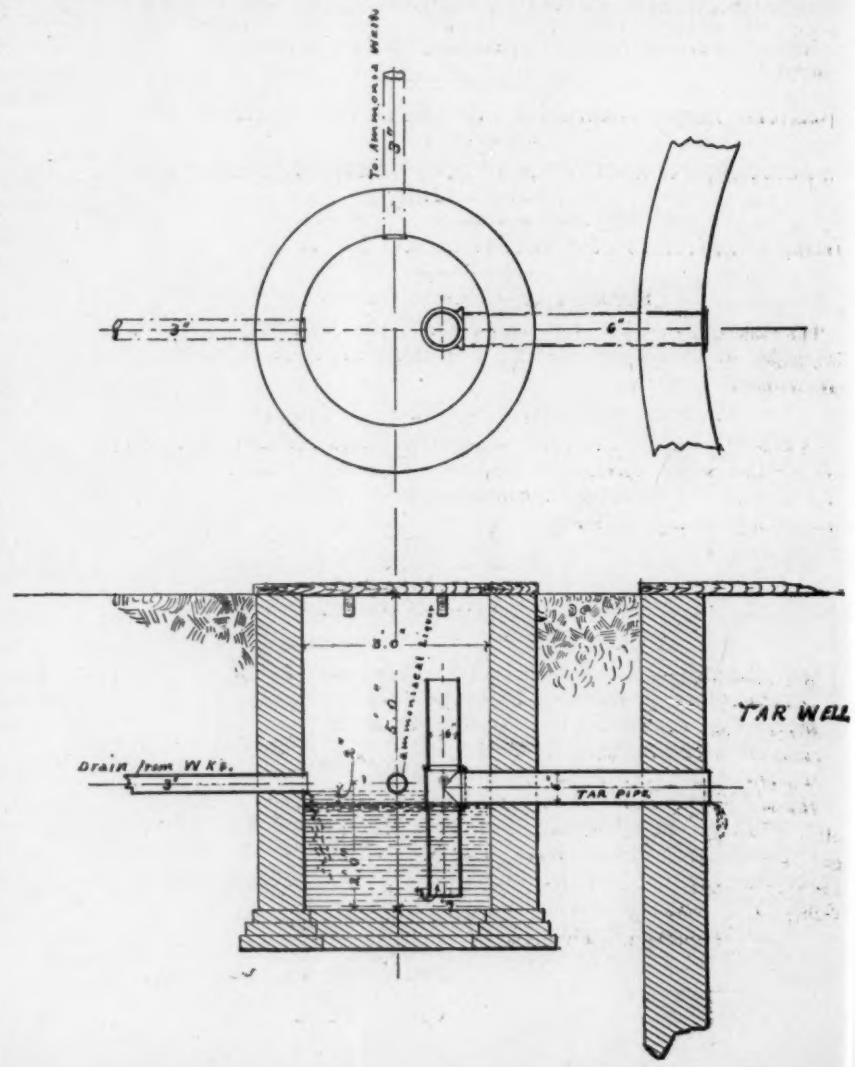
REMOVAL OF AMMONIA FROM ILLUMINATING GAS AND THE BEST METHOD OF ITS ACCOMPLISHMENT.

This is not a new subject, and when I have done I am afraid you will say with a gentleman who, at a meeting of the North of England Gas Association (when the gentleman who had been reading the paper had finished) arose, and said: I must express my disappointment with the paper, for it has told us nothing at all. However, in the manufacture of illuminating gas, we are being met on every hand with the question: How can I cut down this expense, and how can I reduce that? What can I get for this residual, and what can I realize on that? Now there is the ammonia (I hear some of our gas engineers say), we ought to get something for it. It has been running to waste all these years. You begin to negotiate with the ammonia men, and you are confronted with the question, do you take all the ammonia out of your gas? They will ask, what kind of scrubbing and condensing apparatus do you use? Some of you will say, we have a tower scrubber, filled with boards, coke or scrap tin, and into this we run a stream of water; some say, every hour or so I turn the water into the scrubber, allowing it to flow the full of a ¾ inch pipe for about five minutes, washing the liquor and tar to the bottom, and saturating the scrubbing material. This system of working, as you will agree, is bound to be imperfectly attended to, and the scrubber gets no water, except at irregular periods. Then a great many engineers permit a constant stream of clear water to enter the top of the scrubber—the water striking a dash-plate, and, in some cases, out through a rose or sprinkler. If a dash-plate, or spray, is employed, water with considerable pressure must be used, else the force of water against it is not sufficient to spray it over the whole surface of the scrubbing material, doing but very little if any good. Dip washers are used in some gas works for the extraction of the ammonia from the gas, but with doubtful success. In my judgment there is no form of washer that compares with a rotary scrubber-washer in the most complete and thorough removal of the ammonia from gas. If there is one piece of machinery about a gas works that does its work absolutely and well, it is the rotary scrubber-washer. In it the gas is passed through a series of washing and scrubbing wheels. They revolve, and their lower parts are constantly immersed in the liquor, the upper portions always present a thoroughly wetted surface for the absorption of the ammonia, as the gases pass through from one wheel to the other. At the gas outlet of the machine, a quantity of clear water (at rate of 10 gallons to the ton of coal) is run in, and as it passes through the machine from one section to the other, it is gradually strengthened and reaches as high as 6 or 10 ounce liquor. The strength of the liquor depends upon the size of the machine and the work done. It has been urged against the rotary scrubber that it requires an engine to drive the machine, and that it is expensive to keep in operation. As against this objection I will say that it requires power to force water into the top of a tower scrubber, and if a dip washer is used it requires extra steam on the exhauster to force the gas through the water seal. I will venture to say that it requires a greater amount of steam in either case mentioned, and will cost more than the expense of running an engine to revolve a rotary scrubber. The power required to turn a properly constructed machine is so small, that a steam valve is barely lifted from its seat when it is in motion.

I do not wish it understood that I am not in favor of a properly constructed tower scrubber. It certainly has its place, and plays an important part in the purification of gas, and is a valuable adjunct to the rotary scrubber. In the preparation of a commercial article of ammoniacal liquor, and at the same time taking advantage of its purifying properties, I can do no better than describe our apparatus as in actual use in St. Joseph, Mo. Our ammoniacal liquor varies from 4 to 6 ounces in strength. We have abundant condensing capacity. From the condenser the gas passes into the tower scrubber, and from there to the rotary scrubber, when the ammonia is thoroughly taken from the gas. All the tar and liquor from the hydraulic main, condensers, tower scrubber and rotary scrubber run into one drain pipe, and are led into a separator.

We employ a steam pump with suction pipe, connected to the ammonia well, and discharge pipe to the top of the tower scrubber, and have a constant circulation of ammoniacal liquor from the well, through the scrubber, back into the drain pipe, and from there into the separator, when the tar is again separated from the liquor. The apparatus for the distribution of the ammoniacal liquor, in this lower scrubber, consists of a hollow circular casting. In this casting 6 holes are drilled and tapped for the reception of a ¼ inch pipe, resembling, when finished, the hub and spokes of a wheel. These pipes are of suitable length, capped in their outer ends, and are pierced with a number of holes ⅛ of an inch in diameter. A connection is made with this casting from the ammonia pump. With this arrangement a thorough wetting and an even distribution are obtained. The action of the pump is intermittent, and it causes the liquor to cross in irregular streams. Pumping the liquor over and over again serves a double purpose in strengthening the liquor and assists wonderfully in the extraction of sulphureted hydrogen and carbonic acid. We find, as a practical result of this system of scrubbing and washing with ammoniacal liquor, a saving of lime; in other words, when the tower scrubber is in action, we purify 8,000 cubic feet of gas per bushel of quick lime. Without it in action, we purify 6,500 cubic feet.

A sketch of a cheap and effective form of separator is here shown. A circular tank of brick, carefully laid in cement, so as to be perfectly water tight, of suitable depth and brought up to the ground level and furnished with a cover of either iron or wood. It is necessary at times



to inspect the separator to see that it is working properly. You will understand the operation of the separator without an extended description from me here; suffice it to say, that as the tar and ammoniacal liquor run into the separator, the tar, being the heavier, sinks to the level of the tar pipe, as shown; the ammoniacal liquor, floating on top, runs off to the ammonia well.

The liquor from the hydraulic main shows a strength of $\frac{3}{10}$ ounces; from the condenser 4 ounces; tower scrubber $\frac{4}{10}$ ounces; and rotary scrubber, 7 ounces.

In connection with this, I will quote from an admirable paper read by Mr. T. W. Cox, Jr., Sunderland, before the North of England Association, October 6th, 1883.

He says: "The object of a gas manager should be to make the ammonia of his liquor do as much work as possible in the removal of carbonic acid and sulphureted hydrogen from the gas. Every gallon of liquor should, theoretically, if not already combined with other acid, show about 415 cubic inches of impurity per ounce strength. But liquor may, under many conditions, contain more than this amount of impurity, for by using the same liquor to wash the gas over and over again, we find that it can be made to take up as much as 600 cubic inches of impure gases per ounce. The reasons for this are, that, in time, the carbonic acid of the gas turns out the sulphureted hydrogen from its compound in the liquor, and takes its place, leaving the sulphureted hydrogen in a free state in the liquor; and also that, by constantly keeping the liquor in contact with the gas, it slowly gives up ammonia to the gas, and thus its neutral ammonium monocarbonate and ammonium sulphide are gradually converted (respectively) into the acid and hydrosulphide.

"As in these acid salts, the same quantity of ammonia combines with twice as much sulphureted hydrogen and carbonic acid as it does in the case of neutral salts, we see that, by keeping the liquor long enough in contact with the gas, we might possibly cause it to take 830 instead of 415 cubic inches of impurity per ounce."

The question is asked: How much ammonia can we obtain from a ton of coal? With our coal (which is mined in Cherokee County, Kas.), we obtain about 240 liquor ounces of ammoniacal liquor, which is equal to 40 gallons of 6 ounce liquor. The 6 ounce ammoniacal liquor is of the proper strength to distill off into aqua ammonia.

If your works are small, an apparatus for concentrating the liquor into a small bulk is the most advantageous way to work it up and make it merchantable. Forty gallons of 6-ounce ammoniacal liquor concentrated into liquor of 80-ounce strength equal 3¾ gallons, and weigh about 28 pounds (almost a barrel full into a little brown jug).

As to the best method of measurement for the sale of this liquor, I would say that a contract based on, say 4 cents per 100 liquor ounces, or another way, so many cents per pound for a liquor containing 20 per cent. (80 ounce liquor) of ammonia. Some contracts have been made at 12 cents per ton of coal carbonized; the gas company agreeing to erect concentrator run it, and also agrees that ammonia will all be taken out of the gas before it reaches the purifiers.

In the manipulation of the rotary, or any other scrubber or washer, it is very important that the temperature of the fresh water entering the scrubber should be as cold as possible (the colder the better).

Better results are also obtained when the temperature of the gas is as near 60° as possible.

With some good form of rotary scrubber in your works, fresh water at a temperature of 55° or 60°, and good condensers, you can go to bed at night and feel morally certain that the ammonia will be absolutely taken from your gas.

Discussion.

The President—As Mr. Mitchell is not here, and the paper has been read by Mr. Cowdery, you can hardly expect him to answer the questions, but the paper itself is open for discussion. If any member has anything to say on the subject we shall be pleased to hear from him.

Mr. Somerville—I am sorry that the author of this paper is not here. I think it is very important that when one of our own members agrees to read a paper he should, if possible, be present to take part in the discussion which the paper may call forth; but no doubt his absence is unavoidable. Mr. Mitchell says that some contracts for ammonia have been made at the rate of twelve cents per ton of coal carbonized. I would like to have asked him if that sum, in his opinion, was a right and proper amount to receive for his ammonia? We have been receiving, for this eight or nine years, 30 cents per ton of coal carbonized for our ammonia; but I do not think there are many here who can make such a statement. And yet I do not see any reason whatever why you cannot. The charge has been made that we gas managers are not careful to practise the small economies, and it looks to me sometimes as if the charge was just, but, as I said before, there is no reason why anyone carbonizing say eight thousand tons per annum cannot get as much per ton for his ammonia as we are getting. What one can do others can do also. The objection has been made to the odor arising from a sulphate plant. In reply to that I would say, our works are situated right in the heart of the city, hundreds of people are passing the doors of the sulphate factory every day, and yet, during all these years, I have never heard the slightest complaint, and the reason is there is nothing to complain about. In fact, there is no disagreeable odor. I notice Mr. Mitchell states that the power required to run a rotary scrubber is no more than is required to pump water into the tower scrubber. I take exception to that statement. It must take a good deal more power to run an engine and rotary scrubber, with all its wheels and stuffing boxes, than simply to pump the water over and over again into the tower scrubber. I do not like his arrangement of the separator, because I believe that some tar will get over with the liquor. The specific gravity of the tar and liquor is about the same at that point, and some of the tar is sure to get over with the liquor, and this is a great objection to anyone who is taking out the ammonia. The tar ought to be kept entirely separate and not allowed to get into the ammoniacal liquor scrubber at all. My plan is to run everything from the hydraulic, hot scrubber and condensers, into the tar well, which I will call No. 1. From there the liquor overflows into No. 2 well, and, once in a while, some tar with it, which sinks to the bottom, and after a certain accumulation is pumped back into No. 1. From No. 2 the pure liquor flows into No. 3, where it is pumped into the ammoniacal liquor scrubber. The same pump puts it also into the boiler of the sulphate works. For this last twenty years I have laid the slats of my tower scrubber in a very compact form. I never could see the reason for laying them sideways. I put them flat, something like the way lumber is built in a lumber yard. This gives a vast surface for the water and gas to act upon. The distributing arrangement which Mr. Mitchell describes, I care nothing about. I have just as much liquor and water passing through the scrubber as the pump will drive. It runs through in a perfect torrent. It will not hurt the gas one bit as long as you keep the temperature of the liquor up to or above the temperature of the gas. I take all the ammonia out of the gas by the tower scrubber. The amount of sulphate made is 21 lbs. per ton of coal (2,000 lbs.) carbonized. 75 per cent. of this is acid, and 25 per cent. is pure ammonia, which gives about 5¼ lbs. of ammonia per ton of coal. That is as much as it will pay to get out of it. So, you see, the tower scrubber takes all the ammonia out of the gas. I see Mr. Mitchell also believes in cold water, the colder the better; but I have to warn you against that. I grant you if we were making only ammonia—if that was the chief product, then cold water is the best to use. But we are making gas; and my experience is that it is a very serious thing to bring gas, say, at 90° in contact with water at 40°. There is sure to be trouble. I use the water just as little as possible, and never cold. I run the cold water into tank No. 3, where its temperature is increased, and a small amount of water into the second division of the scrubber, where it unites with and forms a weak liquor of almost three ounce strength, which takes out the ammonia as well as the water without hurting the gas. I have had no occasion to clean out my scrubber for seven years, because I allow no tar to get into it. If you keep the scrubber entirely free from tar you will find everything work much better. I think the presence of tar has a tendency to make the gas and water slide as it were away from one another. I use a P. and A. condenser before the scrubber, and every particle of tar and oily matter is taken out by it. I thank Mr. Mitchell for bringiug this subject before the Association, because in these days of much competition, which means cheap gas, anything that tends to enhance the value of your residuals is certainly worthy of our careful consideration.

Mr. Thomas—I learn that Mr. Somerville has received 30 cents per ton of coal carbonized, for ammoniacal liquor. This same question came up at the Zanesville meeting, and it was there stated that 25 cents per ton was about the best price that had been obtained for ammoniacal liquor. I think the statement was made by Mr. Osius at the last meeting of the Ohio Association. In 1882 I made a contract for our liquor at 27½ cents per ton of coal carbonized, the contract running for five years. The liquor that we made averaged about 32 gallons per ton of coal, and the strength of it averaged 10½ ounces.

Mr. Cowdery—I do not believe Mr. Mitchell intended to say that 12 cents per ton of coal carbonized was the proper price to receive for ammonia. If he did intend to say it, I think it is due to the Association to say I believe Mr. Mitchell had some connection with the party buying the ammonia, or running the ammonia works.

The President—If I did not know Mr. Mitchell so well I would be apt to believe that myself. We get nearly three times as much as that.

The thanks of the Association were voted to Mr. Mitchell for his paper and to Mr. Cowdery for reading it.

Mr. Edward Lindsley, of Cleveland, Ohio, then read his paper on

MUNICIPAL CONTROL AS AN ECONOMIC FACTOR.

Among writers and speakers "municipal control" has long been a favorite topic for discussion, so much so that it may be seriously questioned if much remains to be said thereon; but qualified as an "economic factor," perhaps a few thoughts may be deemed not unworthy the consideration of members of this Association.

The manufacture and distribution of gas is a thoroughly practical industry and daily becoming more so; and any consideration that makes it even a little more or less costly to the consumer becomes at once a matter of grave importance. This much admitted, it goes without saying that every step in the direction of saving that which has been produced is a step in the right direction. And right here it may be well to disclaim any intention to consider the right of the municipality to own or conduct all or any business that may exist by virtue of or in connection with street occupancy; but, on the other hand, to assert with positive earnestness the duty of the municipality to exercise, for the benefit of all street occupants, such general supervising care as shall insure to each such protection of their interests as can be assured in no other way. And that there be no conflict of thought between writer and hearer, it may be well to state in definite terms the conviction that that oftentimes serious and always unsatisfactory item denominated *unaccounted-for gas*, might be favorably modified by the exercise of proper municipal control.

In support of this position, let us consider briefly some of the conditions of street occupancy and the relations of the various interests therein to each other: Below the surface (and we are interested beneath rather than upon the surface) is located the sewer, the water main and gas main, and latterly the conduit for electric wires has been added to the list. These, with their various connections or services, when once located, to serve in the highest degree the purpose intended, should be left undisturbed, or if the surrounding material must of necessity be displaced it should be so replaced as to insure all the plant in position remaining as originally placed. Let us consider what, if any, hazard the gas pipes may be subjected to when other installations come to occupy the street or repairs are necessitated upon existing ones. The sewer usually lies in the center of the street at the greatest depth, and if mechanical considerations alone determined the order of occupancy it and its connections should be laid first, and followed by water and gas installations in the order named. In practice, however, this order is often exactly reversed, the sewer going in last. To illustrate: Let us suppose conditions, and, if you please, such as shall illustrate an extreme case.

Given a rather narrow street, of sand and gravel formation, with quicksand beneath. On one side of the street, two feet toward the center from the curb line, at a depth of 42 inches, locate a four inch gas main. On the same side of the street, three feet nearer the center, and two feet lower than the gas main, locate a four inch water main. Connect each of these mains with similar ones at three or four intersecting streets. It now becomes necessary to sewer the street. For that purpose the necessary grade requires a cut of suitable width and 22 feet in depth along the center of the street. Deposit the excavated earth on the same side as the gas and water mains are located, and you have an enormously increased weight above them, a very insecure foundation beneath them, and the general conditions favorable to an indefinite amount of breakage, and likely to culminate in an indefinite amount of loss. Such conditions are not only possible, but have actually occurred, the water main giving way at an intersection, furnished a cascade that carried a goodly portion of the street before it, together with three generous pieces of the gas main, coming from as many directions and uniting in a tee, also located at the aforesaid intersection.

It may be objected that the results described are of unusual occurrence; but it is true, nevertheless, that many of the conditions contributing to such results are frequently furnished, and will continue to be furnished while carelessness, indifference and ignorance figure so largely in the execution of street work. And let me qualify this remark as one not made at all in the spirit of adverse criticism, but in recognition of observed results which are the natural outcome of existing methods, where each operative is a rule unto himself, and naturally exercised chiefly in the direction of his own interest. Indeed, is it wonderful that the tendency is for each to forget the interest of the other? For the purposes of this paper it is unnecessary to enter into a lengthy discussion, involving a wide range of illustration, presenting multiplied instances of difficulty, with appropriate remedies. But there are some facts, or general tendencies, connected with the execution of public work, that it may not be amiss to recognize. It is a matter of common observation that defects are not always remedied, if they can be easily covered from view. A loose filling may satisfy the requirements of the case, if it appears good enough to secure release from responsibility. Responsibility that may be divided among many is, sometimes, difficult to fix anywhere. May we not conclude, then, that the occupancy of our public streets requires more careful supervision. Every town has a street supervisor, or an officer charged with duties indicated by a title corresponding therewith; but judging from local observation, and reports from various districts, the conviction obtains that the location is yet to be discovered where the official and rules of government are fully up to the requirements of proper care of all the varied street interests.

And this suggests the query: What would efficient supervision guarantee to street occupants? It ought to grant immunity against such loss as obtained in the case above named, or if not entire immunity, the loss should have been reduced to a minimum. But more definitely, it should provide an accurate and well-defined plan of operations, based not upon the experience, or desire, of a single interest, but evolved from a consideration of the experience of all the interests involved. It would embrace a rule, under which a gas company for instance would be notified of any proposed excavation, that could by any possibility involve the integrity of their mains; and provide that every street excavation should be by especial permit from the proper municipal officer; and that every other interest in the street be advised of such proposed opening, by the party intending to make it, under penalty in the event of failure to so advise.

Municipal control of this sort would insure to all street occupants early advisement of any proposed operation that might endanger their interests, enabling all to take such steps for self protection as their experience might indicate to be the best—indeed would furnish the only reliable guarantee of proper and adequate protection of all the interests that occupy the streets. The leakage account of the gas company would most likely be reduced, and a favorable impetus be given to the sentiment of "municipal control as an economic factor."

Discussion.

The President—You have heard Mr. Lindsley's paper, which is on an important subject. If any of you have any remarks to make we would like to hear them. I will say, with regard to this matter, that the kind of attention we get in St. Louis is something like this. We have to get a permit when we wish to lay a street main. An ordinance which tells us how we must fill in over the pipe, directs that we must fill in with sand all around. We have to cart our sand there, and cart away the dirt. Then we put the pavement down according to the ordinance. But no matter how good it is, or how well it is done, a street inspector comes around and says that it is not right. Then we are obliged to dig it up again. We may dig it up again and put it down ourselves, but we have to do it again no matter whether it was put down right in the first place or not. The city authorities have some one who is well acquainted with the politicians that rule there, and if we employ him to put down the pavement it will be all right. Whether right or wrong, it is then all right. We have, therefore, come to the conclusion that the best way is to let the city people do it, in the first place. I think that I am right in that statement, but Mr. Thompson, who is the Superintendent of Distribution, can correct my statement, if I am wrong.

Mr. Thompson—What Mr. Egner has said is quite true. We are frequently under the necessity of replacing the granite paved streets, and streets improved with other varieties of pavement, after they have been made good by our own contract men, or in some cases by the city itself. The red tape through which they have got to go in obtaining permission to open improved streets is quite considerable; but a very rigid track is kept of every excavation made by the Gas Company, in the way suggested, so that there is no possibility of any error on the part of the city in charging us with excavations which we did not make; but we have to stand up to the line very rigidly in replacing a street in proper shape, filling in with sand generally to the extent of the entire depth of our excavation in granite paved streets. Of late we have been able to fill in to the depth of 18 inches only, replacing the rest of the depth with clay; but previously all the clay had to be carted away and the entire excavation refilled with sand, which made it very expensive in laying mains and services.

Mr. Lansden—I have been very agreeably disappointed in Mr. Lindsley's paper, for I was misled by the title, "Municipal Control." I do not think any one here can take any exception to the paper which Mr. Lindsley has read, and I move a hearty vote of thanks to him for it. (The motion was carried.)

Report of Committee on Memorials.

Mr. McIlhenny, Chairman of the Committee on Memorials of Deceased Members, read the following report:

Your Committee on Memorials would respectfully report that since our last meeting death has laid its hands on the following members:

Mr. Frank E. Beck, Superintendent Galveston, Tex., gas works, who died September 4th, 1890, at the age of 62. Mr. Beck was appointed Superintendent of the Company in 1867, and continued to serve it as such up to the time of his death, which fact is evidence of the esteem in which he was held by his Company, and is a fitting eulogy on his professional career. He was a charter member and Past-President of the Southwestern Gas Association. As a student of the exact sciences and a sound thinker, he was well known to all the fraternity, who held him in high esteem.

Our brother, Mr. Enoch Veal, Superintendent of the Boonville, Mo., gas works, was called hence on November 10th, 1890, in the 49th year of his age.

Our brother, Mr. Ross Woodmansee, Superintendent of the Davenport, Ia., gas works, passed away on the 5th of December, 1890. He was an old member of this Association, and at all times was ready to assist, by his advice and counsel, any member needing his help.

Our brother, Wm. H. Down, Secretary of the American Meter Company, died in New York city, February 15th, 1891. He was brought up in the meter factory of his father, had been a Superintendent of the Greenpoint, L. I., gas works, and for several years prior to his illness and death, as said before, was Secretary of the American Meter Company. He was a faithful member of our Association, and a genial gentleman, who enjoyed the love and respect of all who knew him well.

The last and youngest of the five, of whom we make record to day, and express our sorrow for their loss, was Edwin M. Starr, Superintendent of the Richmond, Ind., gas works, who received "the dreaded summons" on the 28th of April, 1891, in his 28th year. He was a member of this Association for some years, and was a young man of remarkable promise. He was greatly respected in the community in which he lived, and the regret at his loss was expressed in many ways.

Therefore, In the death of these members our Association has sustained a loss that is keenly felt by all the members, and they will be long remembered for their virtues, their kindly words and good deeds; therefore,

Be it Resolved, That this report be spread on the minutes of this Association, and a copy be sent to the families of our deceased brothers, expressing thereby our sorrow for and sympathy with them in their loss.

Jno. McIlhenny,
W. H. Odiorne,
C. M. Keller,
} Committee.

In session, Louisville, Ky., May 21st, 1891.

Mr. Boardman—I move the report be received and the recommendations therein contained be adopted, and that by a rising vote we show our sympathy with the bereaved families, and endorse the sentiments therein contained.

Mr. Leach—I second the motion. (The motion was carried.)

Letters of Regret.

At this point the Secretary announced that letters and telegrams regretting the inability of the senders to be present at the meeting had been received from—

Eugene Vanderpool,	A. C. Wood,	C. R. Faben, Jr.,
V. L. Elbert,	K. M. Mitchell,	C. H. Nettleton,
G. G. Ramsdell,	G. S. Page,	R. B. Taber,
S. M. Hart,	J. R. Smedberg,	E. C. Jones,
	Jas. M. Starr.	

(To be continued.)

Life of Incandescent Lamps.

In the manufacture of incandescent lamps, success may be said to depend on several small points. The exhaustion, we know, must be as complete as possible to insure long life and reasonable efficiency. During the exhausting process it is the usual practice to heat the carbon filament to incandescence, in order that all air contained in the substance may be expelled. It has been found that if the filament is heated at too early a point during the exhausting process it produces a more or less porous condition of the carbon, and that a lamp made in this manner has neither a very long life nor a high degree of efficiency after having been in use for a short time. As an improvement on this, the globes are exhausted to as great a degree as may be, and in as short a time as possible; then the current is passed through the carbon, and it is brought to incandescence for a few moments while the vacuum pump is still working. The vacuum pump used in this process is wholly mechanical and very quick acting, and is reported to be much quicker in its action than the mercury pumps commonly in use for this purpose. From two sets of lamps made from similar filaments, a writer in the *Stationary Engineer* has discovered that one set exhausted in the usual way by mercury pumps, while the filaments were heated by the current, the other set treated with the mechanical pump and the current sent through the filament just previous to sealing the lamps, showed in the latter case the highest efficiency and longest life. The reasons for this may be inferred to have been that in the former case the filaments were partially disintegrated in the rarefied atmosphere.

[A Paper read before the Incorporated Institution (England) of Gas Engineers. Reprinted from the *Journal of Gas Lighting*.]

A Few Notes on Carbureted Water Gas at Beckton.

By Mr. T. Goulden.

Before proceeding to lay before the members of the Institution details of the manufacture of carbureted water gas at Beckton, it may be well to mention that the object in adopting it was not so much to supplant existing methods of gas manufacture, as to have a section of the works which is capable of, at as small a cost as possible, turning out a sufficient quantity of gas of high illuminating power for admixture with common gas in the proportion found necessary to ensure the delivery of gas of about 17 candle power from the works.

It may be in the minds of members present that our esteemed President, Mr. G. C. Trewby, visited the United States in 1889; and over there he thoroughly studied the working of the different systems of water gas plant employed in the manufacture of illuminating gas. Consequent on this inquiry, the plant finally decided on for erection at Beckton was the form known as the "Improved Lowe"—an apparatus apparently eminently adapted for dealing with varied classes of oils, both from the scientific method of its construction, and the admirable arrangement of its working parts, which render this apparatus so easy of manipulation as it is. This, although protected by patent rights in America, is not so here, to the best of the writer's belief. A section of plant on this system was erected at Beckton for the manufacture of 1,000,000 cubic feet of gas per day by the United Gas Improvement Company, of Philadelphia, in the beginning of this year, and on this apparatus mainly the statistics hereafter given have been arrived at.

There are, generally speaking, in use in America three classes of carbureted water gas processes: (1) Retort processes—viz., those in which the carbon for the decomposition of the steam is contained in retorts fired externally. (2) Generator processes—viz., those where the carbon for the decomposition of the steam is heated by its own combustion, and where the carbureting of the water gas is a second operation taking place in separate superheaters or retorts, heated by a second fire. (3) A modification of the second class, in which the carbureted water gas is made in a single operation; the gasification and fixing of the oil taking place simultaneously with the manufacture of the water gas in one apparatus heated by the generator fire. To the last of these processes belongs the improved Lowe; and it will be at once seen that great economy in fuel must result in the use of this apparatus against any processes of the first two types, since the heat which is in those blown away as waste, necessitating a second fire for the process of carbureting, is in the Lowe apparatus utilized for the gasification of the oil, giving illuminating value to the water gas produced.

I will now describe the Lowe apparatus at Beckton as briefly as possible. This in its improved form is built in three shells placed in a line; respectively the generator, in which non illuminating water gas is made; the carbureter, in which the oil used for carbureting the water gas is vaporized and partly fixed, and in which the oil gas mixes with the water gas; the mixture of which then passes through the third vessel, the superheater, in which the gas is finally fixed. The shells are lined with fire clay blocks (the carbureter and superheater are of a diameter of 5 feet inside, and the generator 6 feet 6 inches diameter); an annular space of about 2 inches, packed with asbestos or similar non-conducting material, being left between the outer surface of the blocks and the inside of the shells.

The carbureter and the superheater are filled with checker bricks, about 1½ or 2 inches apart, set in tiers; the bricks in each tier being set at right angles to those in the one immediately below it. The practice sometimes is to set the brickwork in the carbureter so as to have continuous scores from top to bottom; but the Beckton plant has the carbureters fitted with tiers arranged as the bricks in the superheater are invariably set—viz., with the bricks so placed that the spaces between

one tier baffle those of the next tier but one below it, thus thoroughly breaking up the flow of gases passing through the vessels.

The generator is fitted with a feeding-door at the top. Round its circumference immediately below the grate bars, which are supported on an iron frame, are four clinkering doors spaced equally round the shell, through which the clinkers are withdrawn and the fire cleaned. Below the grate is riveted an inverted wrought-iron cone, the frustum being fitted with a gas tight valve, by which, when opened, the ashes escape from the apparatus. The generator is connected near its top with the carbureter by a fire-clay lined cast-iron connection; this in its turn being connected at the bottom with the superheater by a similar connection. At the top of the superheater is the outlet connection, fitted with a stack valve, by which the waste blast gases escape from the apparatus when "blowing up" (as the process of heating up the fuel and superheating apparatus, preparatory to making gas, is termed). This valve, as are all the other valves required to be handled in making gas, is manipulated from the "working floor," fixed at about 14 feet from the ground floor.

The outlet connection on the superheater is carried downwards into a cylindrical hydraulic seal-box, and forms a jacket for a series of tubes connected by a cast-iron annulus top and bottom, forming an oil-heater in which the gas being generated in the apparatus pre-heats the oil, previous to its entry into the carbureter, which it does by means of a connection with a spray regulating arrangement fitted in the top cover. On leaving the seal-box, the gas is scrubbed and condensed by suitable apparatus, coupled to a relief gasholder, in the outlet of which is fixed an exhauster, by means of which the gas is forced through the purifiers.

The heating-up of the apparatus to the necessary temperature is effected by an air-blast furnished by a Sturtevant blower, worked by a 20-horse power engine running at about 300 revolutions per minute. The primary air is brought into the generator under the grate bars by a branch off the main duct; the secondary air entering the top of the carbureter and the bottom of the superheater by similar smaller branches. The admission of air to the different vessels by these branches is controlled in each case by a valve handled from the working floor. A relief-valve is fitted in each of these pipes. The admission of steam under the generator grate bars is also regulated from the floor; and it may be noted that it is important that the steam should be well spread over the area of the generator fire.

The supply of oil to the apparatus is effected from a measuring tank by means of a small steam pump, thence through the oil heater, and so through the spray arrangement into the carbureter.

Having described the general arrangement of the plant, I will now explain the method of working it. At first starting, the generator, being filled with hot coke or with cold coke laid on shavings and lit, is heated, the stack valve in the superheater being closed, air being drawn through the fuel under natural draught and escaping by the feeding opening till the generator fire is nicely hot, when the feeding door can be shut, the stack valve opened, and a gentle blast of air turned on into the generator, which, afterwards passing through the carbureter and superheater, at first dries them, and afterwards, a fuller blast being put on, brings the top of the carbureter to a dull red. Secondary air is then turned into the carbureter, combusting in it the gases generated by the passage of the primary air through the generator fuel. The same process is repeated with the superheater till the brickwork in both vessels is thoroughly heated up. The heats can be watched through sight cocks fitted on the shells of each vessel. If a heavy oil is to be worked, it is advisable to have the carbureter at a dull red heat; the superheater being worked by a heat gradually increasing to a cherry red towards its outlet. A light oil can be more violently "cracked up" in the carbureter, which should be worked at a brighter heat for this purpose. As a rule, when dealing with a strange oil, heats should be run dull; and gradually increasing to the brightest heat the particular oil will bear without depositing lampblack on the checker bricks—a most objectionable feature, as this means a cessation of gas making for some time, during which the lampblack has to be burnt out, and then for the apparatus to cool again to a working temperature.

Now, assuming the apparatus to be at its proper temperature, the fuel in the generator filled well up, clean and thoroughly hot, gas making may be commenced. The air blast is shut off the vessels, commencing with the superheater and working back to the generator. Steam at about 120 lbs. pressure is then turned on under the generator fuel, and passing upwards is decomposed into hydrogen and oxygen; the oxygen combining eventually with the fuel to form carbonic oxide with a small percentage of carbonic acid. To give illuminating power to this non illuminating water gas passing into the carbureter, oil is turned on by a small steam pump driving it through the oil heater to the carbureter; the spraying arrangement being set to effect the entry of the oil at about 30 to 40 lbs. pressure, in order to thoroughly disperse it over the area of the heated brickwork. The oil is completely vaporized in the carbureter, and mixed with water gas, the mixture of which, passing on through the superheater, is then thoroughly fixed by the more highly heated brickwork in that vessel. From the superheater the gas passes through the seal to the relief holder, on its way being scrubbed and condensed; and from there through the exhauster into the purifiers. The heats in the carbureting and superheating vessels are readily regulated, and should be worked just under the sooting point of the oil being used; the deposition on a paper held in a jet of the outlet gas showing this at once. The apparatus is run thus for a period varying from six to nine minutes. when the oil is shut off; steam being kept on for from a minute to two minutes longer, to clear the oil vapor out of the apparatus.

The heats by this time are running low, and the proportion of carbonic acid in the water gas is, in consequence, increasing rapidly; rendering it necessary to terminate the run and to blow up our heats again. Steam is shut off, the stack valve opened, and the air blast put on under the generator, then into the carbureter and superheater respectively. The heat is thus blown up for about the same length of time as was taken by the run, when gas making will be again carried on. Thus the work goes on—alternate runs and blows only varied by periods at intervals of about four hours for clinkering the fire and filling up the generator with fresh fuel. One man on the working floor can readily manipulate a plant working 500,000 cubic feet per day.

The Beckton plant is in two tiers of apparatus built side by side, each set of 500,000 cubic feet per day capacity. This method of erection enables us to have a steady flow of gas being manufactured; one set of apparatus being blown up while the other is making gas, and *vice versa*.

As to cost of manufacturing gas by this process. Two sets of plant, as above described, can readily be worked by two men on the working floor, besides whom will be required two men engaged in cleaning fires, charging generators and doing odd work generally, and one man working the engine driving the fan and firing the boiler.

Working eight hour shifts, 15 men per day will manufacture 1,000,000 cubic feet of gas; and it will be readily understood that having regard to the general attitude of working men of the present day, this is a very important feature in the working of a gas producing plant. The manufacturing wages per 1,000 feet of gas in the purifiers on this basis are 0.98d.

Before dealing any further with the cost of producing carbureted water gas, the writer would draw attention to a few facts connected with the oil carbonized in the apparatus. Various oils have been tested at Beckton—American, Russian, and British; the latter being produced from shale. American gas oil is unfortunately at present beyond the possibility of working here, owing to its low flashing point The shale oil tested, besides giving a comparatively low yield of illuminating constituents, evolves in the production of gas a large proportion of sulphureted hydrogen, and compounds of sulphur other than sulphureted hydrogen. The Russian oil thus practically becomes a *sine qua non* with gas making plant here. It was hoped at first that "Novorrossisk"—a Russian oil of about .943 specific gravity, having a flashing point of 165° Fahr.—could be utilized. This oil is equal to about 1,040 sperm candles per gallon, and is very cheap; but it contains from 7 to 10 per cent. of free carbon and pitch, so this otherwise excellent oil is rendered impracticable for use with the Beckton apparatus by the pertinacity with which the carbureter and superheater will insist upon being clogged up—in the case of a low heat, by pitch and coke; and in the event of a higher heat, by lampblack. The production of the apparatus, due to constant burning out and subsequent re-cooling, is diminished thus to less than one half of its normal output.

After trying many oils, the one apparently suiting the apparatus best was found to be a distillate of about .860 specific gravity with a flashing point of about 130° Fahr.; giving an illuminating power of about 1,200 candles per gallon. This oil, leaving no residue on being distilled, was found to work admirably; readily burning off, giving a high illuminating power to the gas made, and leaving the checker bricks in the apparatus clean at temperatures varying over a wide range. With this oil an illuminating gas has been made of 29½ candle power, with an expenditure of 4.5 gallons per 1,000 cubic feet of gas.

Taking the value of a ton of Lesmahagow as 74,000 candles, and calculating on the basis of the value of the oil just given, an equal result (74,000 candles) will be obtained by the use of 56.4 gallons, worth, at the rate of 3½d. per gallon, 16s. 5½d. The coke used per 1,000 feet of carbureted water gas is about 45 lbs. The total cost of 1,000 feet of gas of 29½-candle power will thus be, for manufacturing wages and material:

	s.	d.
Oil, 4½ gallons, at 3½d. per gallon	1	3¾
Coke, 45 lbs., at 12s. 6d. per ton	0	3
Manufacturing wages (including ¼d. for purification)	0	1½
Total	1	8¼

No mention is made of water used in condensing and scrubbing, the tar produced being held to counterbalance this; 25-candle gas would, at the same rates, be made for 1s. 6d. per 1,000 cubic feet.

The carbonic acid in the crude gas made at Beckton is kept well down, generally about 4 per cent.—a low figure, using coke in the apparatus.

The writer has done his best, in the short space of time at his disposal, to familiarize his hearers with what he considers to be one of the best types of illuminating water gas plant yet invented. The study of this gas is a most interesting one, and there can be no doubt it will be forced generally on the gas world in this country before long, by the increased demands for illuminating power which will necessarily come with the spread of the electric light. Of the economical efficiency of illuminating water gas, considered as an enricher of coal gas, there can be no doubt—given in the first place good plant, and secondly a good oil, at a fairly cheap rate, to work in it.

[A Paper Read before the Incorporated Institution (England) of Gas Engineers. Reprinted from the *Journal of Gas Lighting*.]

Carbureted Water Gas.

By Mr. A. G. Glasgow, Philadelphia, Pa.

The subject of this paper is a broad one, and he is ambitious indeed who does not immediately qualify its announcement by defining his limits of treatment. Upon the present occasion I am content to confine my remarks to the two questions that it is reasonable to infer will most interest British gas engineers, viz.: (1) Under what conditions is the manufacture of carbureted water gas in this country advisable? (2) Supposing such conditions exist, what are the principal features regulating the successful design and operation of a carbureted water gas setting? As the former question is mainly one of shillings and pence—although other considerations, hereafter named, may largely influence it—I propose to give first and fully the working results usually obtained in water gas manufacture, from which a comparison can be readily drawn between the cost of water gas at any given point, and its equivalent under the prevailing system of manufacture. The following results are usually obtainable with a well designed water gas setting, making gas of from 24 to 30-candle power.

Generator Fuel.—Where the apparatus is in comparatively constant operation, the gross consumption of fuel in the generator should not exceed 32 lbs. of good gas coke per 1,000 cubic feet of purified gas. Where the apparatus is in use about half the time, 35 lbs. should not be exceeded. If its use averages five or six hours a day, 40 lbs. of coke will be required. Where the capacity of the apparatus is small—less (say) than 200,000 cubic feet per 24 hours—these figures are usually, although not always, overrun. It should be noted that screenings are recovered from the generator ash to the extent of about 5 lbs. per 1,000 cubic feet of gas. These can be burned under the boiler or returned to the generator fire, thereby correspondingly lessening the gross consumption of generator fuel quoted above.

Boiler Fuel.—A fair average of the quantity of fuel consumed under boilers, when the daily capacity of plant approaches 500,000 cubic feet, is 8 lbs. of coke per 1,000 cubic feet of gas made. Coke, however, is seldom used for this purpose; a cheaper substitute, in the shape of breeze, coal dust, or screenings from the generator, being usually employed. When a better disposition cannot be made of the oil tar, it can be burned to great advantage under the boilers. I shall refer to this again under the head of "Oil Tar."

Oil.—This is the crucial feature governing the economic manufacture of carbureted water gas. Its abundance and cheapness account for the wonderful recent development of water gas in the United States. Does its expense inhibit a corresponding development in this country? Parliamentary restrictions forbid the storage of oils with flashing-points below 73° Fahr.; so we may drop American crude oils and light distillates from our consideration. It may be well, however, to note that such oils will, when properly treated, enrich water gas in the proportion of 7 candles to the gallon, while each gallon yields in bulk about 83 cubic feet of oil gas—that is to say, 28-candle power carbureted water gas, in the proportion of 667 cubic feet of "blue" gas to 333 cubic feet of oil gas, can be obtained with 4 English gallons of such oils.* I have had a recent opportunity of trying several Russian distillates, the flashing-points of which exceed the statutory limit, with gratifying results. Some of them—notably one known as "solar distillate"—quite equalled the American oils mentioned above. The cost of this oil, I am told, is 3¼d. per gallon; making the total cost of the oil 11¼d. per 1,000 cubic feet of 24-candle power gas.

Labor.—The labor required depends largely upon the capacity of plant and size of the individual machines. Taking, as a basis for this and the succeeding estimates, a plant of 1,000,000 cubic feet capacity, composed of two 500,000 cubic feet machines, the generating labor per shift may be classed as follows: 1 foreman for boilers, 2 gas makers, and 2 helpers—total, 5. With eight hour shifts, at 4s. 6d. per man, this would be 0.8d., and with twelve-hour shifts 0.54d. per 1,000 cubic feet. With a 2,000,000 cubic feet plant, composed of two 1,000,000 feet sets and a simple mechanical system for handling the coke, the same number of men would suffice; making the total generating labor 0.4d. and 0.27d. respectively for eight and twelve hour shifts.

Purification.—The expense of purification varies with the oil and coke, but is practically the same as with coal gas. The ammonia present is inconsiderable.

Water.—The total consumption of water, covering all purposes, is usually about 50 gallons per 1,000 cubic feet. The bulk of this water is circulated continuously; the oil tar separating by gravity.

Repairs and Maintenance.—The item of repairs to generating plant is extremely small. It should not exceed ¼d. per 1,000 cubic feet. In well built American water gas works, ¼d. will cover all repairs to manufacturing plant, including gasholders; and it is seldom that the charge reaches this figure.

Superintendence.—This item will never exceed ¼d. per 1,000 cubic feet, and will rapidly grow less as the make increases.

Oil Tar, a Residual.—Where Lima crude oil (the usual and cheapest American carbureting agent) is used, oil tar is recovered to the extent of 15 per cent. of the total quantity of oil consumed. It is true that this tar contains in fixed suspension at ordinary temperatures, about 25 per cent. of water; but, as it is marketed or used in this form, without further treatment, this feature need not be here considered. Since, when burned under the boilers with a small quantity of the cheapest solid fuel, this tar is sufficient to generate the steam required, and moreover enables the fireman, while maintaining a uniform steam pressure, to give practically his whole time to other duties (such as clinkering and coaling the generators), it makes a most satisfactory boiler fuel. Of late years, however, it has been generally recognized by the American market as too valuable a product for such service, and is now turned over to chemical works and tar distillers at a price invariably in excess of the cost of an equal quantity of the original oil, and in some localities at double this cost. I have no knowledge of what the return from this source will be in this country; but it will certainly equal the cost of the water used. Both of these items, therefore, are struck out of the following estimate.

Total Cost, in the Holder, of 1,000 Cubic Feet of 24-Candle Power Water Gas.

	s.	d.
40 lbs. of coke, at 15s. per ton	0	3¼
Oil, as previously quoted	0	11¼
Labor, total employed	0	1½
Purification material	0	0½
Repairs and maintenance	0	0¾
Superintendence	0	0½
Total	1	6

This figure contemplates the independent operations of a water gas plant without connection with coal gas manufacture. By a judicious combination of the two systems, so that coke hot from the retorts can be fed directly into generators, while the furnace clinkerers can look after generator fires, a material saving can be effected.

Regarding water gas as an enriching agent, we have simply to compare the above price with the cost of cannel gas of equal luminosity. If the figures are equal, the balance of favor rests decidedly with water gas, for the following reasons: The greatly reduced ground space required; the large difference in the first cost of plant; the ability to change the candle power at will, and instantly; the ability to increase the make to the full capacity of plant at three hours' notice, and without injury to the apparatus (half this time suffices where hot coke is available); the ability to shut down the plant instantly without loss of gas, and to keep it idle for a number of hours without appreciable loss in economy; freedom from the depreciating influence of cannel upon the coke; and the reduced output of coke, and consequent probability of an increase in the price of that commodity.

* The author explained that the English gallon is about 20 per cent. more than the American one.

So much for water gas as an enricher. Now let us see what chance it will have as a recognized system of manufacture; let us compare it for a moment with standard coal gas of 16-candle power.

Gas of 24 candle power at 1s. 6d. per 1,000 cubic feet is the exact equivalent in luminosity of 16-candle gas at 1s. The consumer, let us suppose, pays 2s. 6d. for his 16-candle gas, costing 1s. in the holder. He can, therefore, afford to pay at the rate of 3s. 9d. for a 24 candle gas. By an expenditure of 6d. at the works, the consumer is benefited 1s. 3d.; or, in other words, the gas company makes an additional profit of 9d. per 1,000 cubic feet on the gas sold—the position of the consumer remains unchanged. In spite of the consequent reduction of 33 per cent. in the output, the advantage lies with the richer gas, unless the net profit from the coal gas exceeds 1s. 6d. per 1,000 cubic feet.

I am well aware of the weakness of the foregoing line of reasoning. In the first place, no attention has been paid to gas used for other than illuminating purposes. Also, the consumer is regarded as willing to entrust his welfare to the hands of the local gas company—an attitude absurdly foreign to his nature all the world over. But the argument seems sufficiently stable to justify me in presenting it as an indication that there may be a wider field for the manufacture of water gas in this country than the mere displacing of cannel can afford; and, in my opinion, this opening becomes positive and assured when we have a system of retorts and water gas apparatus so intimately combined that the whole of the coal is converted into gas, with an absolute minimum of labor, space, and cost of plant. Such an apparatus, of approved design, is about to be placed upon the market.

Let us now pass to the second and last question for consideration—viz., what are the principal features regulating the successful design and operation of a carbureted water gas setting? The design and operation are mutually dependent, and may be treated of together, as follows: Keep the generator fire in a uniformly hot and healthy condition, varying as little as possible from the best temperature for gas production. This necessitates short "runs" and "blows," their lengths being determined experimentally. The generator fire must be sufficiently deep to insure proper decomposition of the steam when the apparatus is working to capacity. Never admit an excess of steam; always admit a sufficiency of steam. So adjust the blasts that the generator and superheater will reach their proper respective heats simultaneously, while all the carbonic oxide produced is being consumed in the superheater with no excess of air. This necessitates the proper relation between the cross section and the depth of the generator fire—a most important factor.

The correct proportion of superheating space depends somewhat upon the oil to be used; but it may be laid down as a general rule that all oils do better when gasified by a prolonged exposure to a moderate heat than when brought into briefer contact with a highly heated medium. Furthermore, the larger the superheater the less the variation from proper temperature during a "run," and therefore the decreased production of tar. It may be noted here that the heats should never be carried sufficiently high to produce lampblack, it being always preferable to incline rather to the production of tar, which is a useful residual, and creates no nuisance from stoppages. The features limiting the size of the superheater are: The loss of the gas contained therein at the end of each run; the increased loss from radiation and air convection; the difficulty in maintaining properly distributed heats; the increased time required in bringing into action a cold apparatus; and the limit to the beneficial influence of the heat upon the oil vapors. These points have been practically and carefully determined for American oils, and there is no reason why the same general proportions should not hold good in England.

It is essential that the heavier oils should be pre-heated to a considerable degree before their introduction to the apparatus; the most successful treatment requiring that the oil should be raised from atmospheric to the final temperature of issue from the superheater by gradual and gentle increments of heat.

On Lubricators for Machinery.

The *American Engineer*, in calling attention to this subject, say that it is friction and not work that wears out a machine. It is, therefore, the object of every good mechanic to lessen the friction of every bearing surface, either by strict attention to the character of the bearing surfaces themselves, or by the application of carefully selected lubricators. Lubricators are used freely—too freely sometimes—on almost all machinery, but it is not always that the operators understand the nature of the lubricant that they employ, and consequently it often happens that they make anything but a wise selection. It may, therefore, be of some use to engineers and others if we consider this subject carefully.

It requires very little experience to teach us that very different qualities are required in the lubricators that are used for different purposes, and it will be found on examination that there are three circumstances that should guide us in making a selection of a lubricator of a proper character. These are, first, the character of the work that is to be done, as for example, whether it is light or heavy; thus a very different lubricator is needed for heavy shaftings from that which is necessary for fine work like watches, or even spindles. Secondly, the character of the surfaces in use. Thus if a man were to use the same lubricator for fine steel journals running in metal boxes that he had found best for a cast-iron journal running in a wooden box, he would make a great mistake, and most workmen of average information know this. But they do not seem to know that cast iron or even coarse wrought iron working on cast iron, requires a very different lubricator from that used to the best advantage on hard and finely polished steel running in brass or hard gun-metal—and yet we have seen this mistake made over and over again. It is no uncommon thing to see fine oil, such as is properly used on the finest machinery, applied to the heaviest planers with cast-iron beds and table, and this upon the very erroneous principle that since such oil is the most expensive it must be the best, and should therefore be applied to the most costly machines, utterly irrespective of their special characters. Thirdly, the temperature under which the machinery works has an important bearing on this subject. If the machinery should be exposed to the weather, as railroad axles, derricks, etc., a different lubricator should be used in winter from what is used in summer. Great attention is paid to this point in England, and if it pays them to attend to it in a country where the temperature is as steady as it is in Great Britain, much more will it pay us to attend to it in the United States, where the extreme of temperature is so great. In the case of journals running in a highly heated atmosphere as is the case in some forms of the caloric engine, great difficulty is experienced in regard to this matter, but in most such cases it will be found that our dependence must be placed upon plumbago, or some similar body. It will be found that plumbago, properly prepared and applied, forms one of the very best lubricators for all such purposes. These different conditions may be so combined as to give very various results, but they will in general be found to be the chief elements that submit themselves for consideration in any given case.

Where the machinery is heavy and the bearing surfaces press against each other with great force, it is necessary to use a much harder lubricator than would be admissible under opposite circumstances. In all cases the lubricator itself, unless it be a very thin fluid, opposes some resistance to motion. In the case of a watch, the resistance of a lubricator, in the shape of a thickened and gummed up oil, often exceeds the motive power of the machine, and the motion ceases. But in the case of heavy machines, the resistance arising from this source is so small in proportion to the power employed that it is never felt, and here it is often found advantageous to harden the lubricator by chemical means. When the bearing surfaces are very soft and porous, like wood and cast iron, it will be found advantageous to use a very hard lubricator.

Of the different lubricators in use, the degrees of hardness are, plumbago, hard soap, soft soap, tallow, and oils of various degrees of fineness. Different degrees of hardness may be obtained by mixing these, and any degree of hardness may be given to oil or tallow by the use of the alkalies potash and soda, soda giving a hard soap, and potash a soft one. The use of alkalies seems to injure the lubricating quality of oils and fatty substances, but glycerine, which is a bye-product in the manufacture of soap, is an excellent lubricator for very fine machinery. A little alkali renders oil or fat much less susceptible to the action of moderate heat, as the heat of the weather, but destroys its utility as a lubricator for very hot bearings, as the pistons of steam engines, etc. For all temperatures not exceeding that used in ordinary steam engines, purified tallow is the best lubricant, though the difficulty of applying it in the ordinary method has caused it to be superseded by oil. For heavy bearings in the cold there is this objection to tallow, that it is easily scraped off, and as it does not run back by capillary attraction, the surface soon becomes bare. But when mixed with a little plumbago the latter forms a very fine coating on the surface, and diminishes the friction to a wonderful extent. This is a very good way of applying plumbago to metal, though it is often used dry, and is frequently mixed with soap. The latter we have found to be the best for surfaces of wood, whether working against iron or against wood, as in the case of wooden screws working in wooden nuts, such as those used for carpenters' benches. An application of oil does very little good to such surfaces, and even tallow is not very efficient, though it is better than oil. But a little soap, mixed with plumbago and carefully rubbed on, will diminish the friction to a surprising extent, and will enable the workman to

exert nearly twice the pressure with the same effort. For soft and porous cast iron surfaces, such as are sometimes found in the working faces of planing and slotting machines, though their presence there is an evidence of ignorance or carelessness on the part of the builder, there is no better lubricating agent than plumbago. A writer in the *Journal of the Franklin Institute* states that a planer whose bedplate required the force of eight men to slide it when lubricated with the best ordinary material, was easily shifted with one hand when plumbago of good quality was applied. The same thing has occurred in our own experience. The working face of a heavy slotting machine began to cut, even though oiled with the best oil. Tallow was then applied, but without effect; and even hard soap failed to prevent the cutting, heating, and destruction of the working surfaces. On applying plumbago, the machine at once worked smoothly and continued to do so.

We may here remark that many have been disappointed in the use of plumbago, because the article employed has been poor. If there be any grit present, the application of plumbago will prove worse than useless; but if the plumbago be really good there is no lubricator equal to it in the conditions we have named. We suspect, however, that there are great differences in the qualities of different samples of what may be called pure plumbago. Some plumbago which we had every reason to believe pure, did not work well. It caked and added much to the friction, forming hard spots on the metal surfaces, while other samples have proved entirely free from this defect. It is probable that when this material comes into more extensive use for lubricating purposes we shall learn how to select it, and thus be able to avoid these difficulties.

Some people who have found that plumbago is good for heavy bearings made of coarse material, have supposed that it must be equally good for the most delicate machinery. This is a great mistake. For fine machinery running at high speed, the only specifics are well polished surfaces, of which one, at least, should be very hard and lubricated with the most fluid oil that can be procured.

An important feature in the character of most lubricators is their relations to air and to iron dust. Some oils gum or dry up very rapidly on exposure to air, and in some this action is greatly increased by the presence of the minute particles of iron that are scraped off by the friction of the moving surfaces. Oil for watches, sewing machines, gun locks and fine machinery of all kinds, should be very carefully purified from all matter that tends to increase this quality. The methods of purifying these oils belong to chemistry rather than to mechanics, but the subject is one of such great importance that it ought not to be neglected by those who use oil as a lubricator. The old plan with watchmakers was to expose the oil in a bottle to the sun, having first mixed with it scrapings of lead or old nails. All the acid and gummy matter present expended their corroding power on these useless substances, and the remaining oil was, in general, found to be limpid, pure, and capable of being exposed for a long time without thickening. Modern chemistry has, no doubt, devised methods that are much superior to this old plan, but where a little really good oil is needed, the old recipe of the watchmaker is not a bad one.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following correspondence explains itself:

ROSE POLYTECHNIC INSTITUTE,
TERRE HAUTE, IND., June 3, 1891.

To the Editor AMERICAN GAS LIGHT JOURNAL: My attention has been called to some statements recently published in your JOURNAL with regard to the gas made by the Citizens Fuel Gas Company, of this city. The analyses which you have published on pages 712 and 749 of your JOURNAL were all made by myself, but were made with specimens taken at different times. The analysis on page 712 was made with a specimen taken on April 11th. That of the fuel gas, on page 749, was with specimens taken on May 8th and 9th. That of the Terre Haute Gas Company was with a specimen taken on May 11th. The following analyses were with specimens taken on May 13th and 14th:

	Citizens Fuel Gas Co.	Terre Haute Gas Co.
Carbon dioxide	2.0	2.0
Illuminants	22.0	12.6
Oxygen	1.2	0.9
Carbon monoxide	6.1	19.7
Marsh gas	24.4	23.2
Hydrogen	14.9	36.4
Nitrogen	29.4	5.2
Total	100.0	100.0
English heat units per cubic foot.	706	664

The specimens of the gas of the Citizens Fuel Gas Company were all taken at my residence, and represent fairly the character of the gas furnished by them at the times when the analyses were made. You must have been misinformed when you speak of the gas as "non-carbureted." It is made by subjecting a mixture of crude petroleum, air, and steam to a high temperature. However it may seem to those familiar only with the older methods of gas manufacture, there is, to a chemist, no absurdity in supposing that a gas of the composition shown by the analysis may be made by such a process. The introduction of air accounts for the high specific gravity, which seems to surprise you. The gas is used as an illuminating gas by many persons in this city. It is burned from ordinary lava tip burners. The heat units were calculated from the composition of the gases, on the supposition that they are burned to carbon dioxide and water vapor. A determination of the total carbon in the gases was made to furnish the necessary additional data. I have made several analyses for each of the Gas Companies in this city, and I do not wish to take sides in the rivalry between them. I write you because the statements in your JOURNAL have done an injustice to one of the Companies. My analyses have shown that sometimes the one gas and sometimes the other has possessed the greater heating power. Yours very respectfully, W. A. NOYES.

THE Madison (Wis.) Water Gas Fuel Company has been incorporated by Messrs. E. W. Howe, Moses E. Alley, F. P. Hanchette, E. E. Phillips, and F. M. Whittaker.

IT is understood that the Standard Gas Light Company will construct a manufacturing station on the property owned by it at the foot of East 19th street, this city.

AT the annual meeting of the shareholders in the Camden (N. J.) Gas Light Company the following Directors were elected: Benjamin F. Archer, Charles Watson, Richard F. Smith, Samuel C. Cooper, and John McIlhenny. The Board subsequently organized as follows: President, Benjamin F. Archer; Secretary and Treasurer, Charles Watson.

MR. THOMAS ROYCRAFT, Superintendent of the Grand Forks (N. D.) Gas and Electric Light Company, has just returned home from his wedding trip. Good luck to him.

WE regret to chronicle the death of Mrs. Sarah Lawrence, mother of Mr. Francis W. Lawrence, Treasurer of the Brookline (Mass.) Gas Light Company.

MR. HERMAN WILKIEMEYER, Superintendent and Secretary of the Portsmouth (O.) Gas Company has been appointed Superintendent of the Evansville (Ind.) Gas and Electric Light Company. He takes charge on July 1st.

THE Detroit Gas Light Company's offices have been removed to the Company's new and handsome office buildings, 42 West Congress street.

THE resolution reducing the price of gas at Richmond, Va., to $1.25 per 1,000 cubic feet, on and after the termination of the current fiscal year, has been adopted by the Common Council.

THE proprietors of the Muscatine (Ia.) Gas and Electric Light Company have issued the following circular: "On and after June 1st, 1891, the Muscatine Gas and Electric Light Company will reduce the rates of gas and electric light to their consumers, as follows: For all 16-candle power incandescent electric lights, 50 cents per month; for all 32-candle power incandescent electric lights, $1 per month. All renewals will be furnished free of charge. Time of running, from early twilight until 12 o'clock, P.M., and during the months of October, November, December, January, February and March, from 6 until 8 A.M. To consumers of electric light, gas will be furnished at $2 per 1,000. To all consumers of gas alone, when the consumption is 1,000 cubic feet or over per month, $2.25 per 1,000. Special rates on either gas or electric light to hotels and users of gas stoves. On June 1st we will have on exhibition at our office a new and complete line of gas stoves, and the public are invited to call and examine them. We will also furnish any who desire the arc light at reasonable rates."

A QUEER case of thievery is reported from Chicago, where John Christie was arrested by Central Station detectives some weeks ago, charged with hauling away pipe that had been distributed along the surface of Cottage Grove avenue, near 60th street. At the preliminary hearing, had before Justice Bradwell, Christie admitted taking away the pipe, but claimed he had been employed by a Natural Gas Company, doing business in Indiana, to take up the pipe, claiming the latter as its property.

Superintendent Chichester, of the Gas Company, swore that the pipe was the property of the Company. Several other witnesses testified that Christie had tried to hire them to do the work. He was held in bonds for trial.

It is likely that the proprietors of the Morristown (N. J.) Gas Company will build a complete new plant, which course is forced upon them from the greatly increased demand for gas in that city.

The State Board of Assessors of New Jersey have filed their first returns respecting miscellaneous corporations of the State. In the return are indexed 83 gas and electric light companies, who are called upon to pay a total tax running well up into the thousands.

The Peoples' Gas Light and Coke Company, of Chicago, has taken out permits for the erection of certain brick buildings, at the corner of Division street and Elston avenue, and others to be located at 781 and 783 Center avenue. The estimated cost of same is put at $30,000.

Judge Aldrich, of Worcester, Mass., has given his decision on the defendant's motion for a new trial in the case of Albert I. Thompson vs. Worcester Gas Light Company, which was argued before him Saturday, May 23. The court allows the motion, sets aside the verdict and grants a new trial. This case was tried by a jury in the Superior Court, April 8, when the plaintiff was awarded $1,000 damages for personal injuries received by the defendant's negligence while at work around a gas meter in the Estabrook building, 54 Pleasant street, February 25, 1890. The defendant subsequently moved for a new trial on the ground that the verdict was against the law, the evidence and the weight of evidence.

There is some talk of establishing a separate gas and electric lighting plant in the town of Everett, Mass.

Articles incorporating the Nation Light, Heat and Power Company, to operate in Denver, Colorado, have been filed by Messrs. Norman K. Morris, Frank D. Johnson and Abraham M. Southard. The Company is capitalized in $500,000.

Mr. John J. Rowe, Superintendent of the Cairo City (Ills.) Gas Company, writing to the Journal, under date of May 28th, on the subject of "Naphthaline Deposits in Inlet Pipes of Gasholders." says:

To the Editor American Gas Light Journal: I send herewith a few notes respecting my experience in ridding myself of naphthaline deposits in inlet pipes to gas holders—a terrible nuisance that a great many of us often encounter; in fact, naphthaline is a great source of annoyance to most gas engineers, especially to those having pipes running through wet soils. I propose to give my experience with same in the hope that it may prove of some benefit to those of the fraternity who may be troubled in like manner About a year ago I found the back pressure increasing daily from holder—the inlet pipe being tapped for steam, and steam pipe attached near inlet valve, the valve house being situated about 30 feet from holder. I turned on steam, and this worked admirably well for a time, until I found I could pump no water out of inlet drip at holder. I then inserted a small iron rod into the drip pipe and found, at the bottom, what I thought to be naphthaline in a crystallized form. It had accumulated around the suction pipe in a solid mass. This I attributed to the use of steam, as, in my judgment, the steam merely softened the naphthaline, allowing it to settle back in the drip, where it subsequently hardened into crystals. Having two holders to work into, I was afforded an excellent opportunity to experiment with same. I filled the drip-pipe with naphtha of 63° when, in a few minutes, I noticed that the naphtha began to settle. I then tapped one of the bonnets on holder, directly over the inlet pipe, and inserted a ¾ inch pipe with funnel attached. I then poured in about 6 gallons of naphtha, and also poured in, where steam connections had been made near inlet valve, about the same quantity, and allowed the whole to remain in over night. In the morning I pumped inlet drip, and extracted therefrom what naphthaline had been dissolved by the naphtha and held in solution by the same. This gave me a passage into the holder. After again pumping the drip that evening, I poured in a few gallons, as before, allowing it to remain over night, pumping the inlet drip again on the following morning. This completely relieved the trouble. I then cut out the steam pipes, with the intention of never using them again; and I never have. About once or twice a month I insert, at the points named before, a few gallons of naphtha, and have not, since pursuing this course, experienced any further trouble with naphthaline. Steam is used by a great many engineers for the removal of naphthaline deposits; but, in my judgment, steam ought never to be applied where naphtha can be used. Steam may remove the trouble for a time, in one place, but deposits will form elsewhere that will prove equally as bothersome, if not more so. I have found that, where rapid condensation takes place, naphthaline deposits itself freely. Our condensing capacity is rather small for the quantity of gas made, and as a consequence the gas enters the inlet pipe, in the ground leading to the holder, at a few degrees higher temperature than it should do ordinarily. As the works of a great many other engineers are similarly situated in many respects, I trust that this paper may prove of some assistance to them.

The shareholders in the Pomona (Cal.) Gas Company are greatly encouraged over the prospect of a return on their money in the shape of a dividend, which has been long deferred. The rosy outlook is largely chargeable to the efforts of the new Superintendent, Mr. Carter, who has busied himself in bettering the plant and in popularzing the Company with the residents. Since taking hold of the works, Mr. Carter has doubled the output and has largely increased the Company's main system. Energy and perseverance are bound to tell in the long run, and Mr. Carter is plentifully equipped with both.

The works of the Vallejo (Cal.) Electric Light Company are to be erected on Virginia street, and will be completed by July 1st. The officers of the Company are as follows: President, Samuel Brown; Vice-President, John Maguire; Secretary, J. A. Browne; Treasurer, William Walker; Engineer, T. A. Thornton.

It looks as if the Oakland (Cal.) Gas Light and Heat Company will again perform all the public lighting in that city for another year, in view of the fact that it was the sole bidder for the work in the competition recently instituted by the authorities on public lighting account, the contract to run for a year, from July 1st. The Company's proposition was as follows: "For the lighting of the electric street lamps, each and every night until 1 A.M., at the rate of 40 cents per lamp per night, and for the lighting of the gas lamps, located within the illuminating radius of the electric lamps, after 1 A.M., according to the moonlight schedule, at the rate of 5 cents per lamp per night, and in combination therewith for the lighting of the entire number of gas lamps not so displaced by the electric lamps—excepting two lamps located in Lafayette square—according to the moonlight schedule, at the rate of 10 cents per lamp per night, and for the two gas lamps located in Lafayette square, to be lighted according to the moonlight schedule, at the rate of 30 cents per lamp per night, and for the lighting of the public buildings in the city of Oakland by gas, at the rate of $2 per 1,000 cubic feet, meter measurement, and for public buildings by electricity, at the rate of $12 per month for each arc lamp of 2,000-candle power, to burn each and every night until 12 o'clock, and for incandescent electric lamps for public buildings, where said buildings are situated on the line of the Company's wires carrying said incandescent current, at the rate of $1.50 per month for each lamp of 16-candle power, said incandescent lamps to burn each and every night until 12, midnight. Each gas and electric lamp herein bid for for street lighting to be of the same rated candle power as the gas and electric lamps now furnished to the city of Oakland for the lighting of its streets and public buildings. The Company will keep in repair all street lamps."

The Memphis Gas Company recently awarded a contract for the erection of four benches of 6's (throughs), retorts to be 21 feet in length, and to be heated by full depth regenerative furnaces, to the Laclede Fire Brick Manufacturing Company, of St. Louis, the iron work to be furnished by the Bouton Foundry Company, of Chicago. This work is to be virtually a duplicate of that at the Detroit Gas Light Company's works. The Memphis Company will also remodel its water gas plant, and put in the ground about three miles of mains, ranging in diameter from 20-inch to 16 inch and 12-inch.

Writing of this recalls the fact that Mr. J. T. Lynn, the "hustler" who made such a "go" of it at Evansville, Ind., is now in charge at Memphis, and that his new position carries with it a rather brisk initiation. In fact the work of betterment at Memphis means virtually a complete reconstruction of the plant; but such a task has no terrors for Lynn, who is in every sense worthy of the trust put in him. Bright, smart and untiring, Lynn can be counted on to send the gas business right along in Memphis, no matter what opposition will develop.

The proprietors of the Lawrence (Kas.) works have determined to reduce the selling rate to $2.00 per 1,000 cubic feet. The old price was $2.25.

THE mains of the Huntsville (Ala.) Gas Light Company are being carried through Winston street. We understand this is the first move towards completing a large addition to the Company's main system in general.

THE City Council of Danville, Ills., has passed an ordinance granting to J. R. Kendall, of Terre Haute, Ind., and W. Beckwith, of Danville, the right to operate a gas works. Under the ordinance the Company must begin construction work within a specified time, and it is prohibited from at any time charging in excess of $1 per 1,000. The whole thing looks like a strike, for there is certainly not a ghost of a chance to make money in Danville by selling gas at the rate named.

WE are indebted to a local correspondent for the following: "Aurora, Ills., possesses a very well equipped municipal electric lighting plant, and is also abundantly supplied with both gas and electric lights furnished by our local Company, which owns a most extensive and complete equipment in both lines. The Aurora Gas Light Company was incorporated, in 1860, by Messrs. C. L. Hoyt, L. D. Brady, Ira W. Buck and others, though nothing was done until 1867, when the plant was built by Messrs. R. H. Whiting and I B. Copley, at a cost of $86,000. To this amount the sum of $27,000 was added, from time to time, until 1884, since which time the capital stock has been increased to $300,000, including money spent in the purchase of the Excelsior Company's plant, fully paid up. It should be mentioned in this connection that in the years 1889-90 the Company expended $72,000 in improvements. The Company now has 30 miles of gas mains, and during the present year will make extensions, on the East and West sides, of over three miles in all. Mr. I. B. Copley was Manager of the Company until 1886, when he retired, and Mr. I. C. Copley has officiated as Manager since February 4, 1889. The Excelsior Company was organized and built a plant in 1889; but the two Companies were consolidated on September 1, 1890, T. H. Day, President of the Excelsior, becoming Vice-President, and E. W. Trask, Secretary of the Excelsior, being made Secretary of the Aurora Gas Light Company. The stock is all owned in Aurora, and in the hands of 24 persons. The Directors and other officers of the Company—all prominent citizens and well known business men—are: President, I. B. Copley; Vice-President, T. H. Day; Secretary, E. W. Trask; Treasurer and Manager, I. C. Copley; Directors, the officers and Messrs. H. H. Evans, J. O. Curry, E. S. Hobbs, S. D. Seamans, J. H. Pease, J. O. Mason and W. S. Beaupre. The Superintendent of the works is Mr. P. O. Malley. It is interesting to note the reduction made by the Company in the price of gas during past years. From 1868 to 1872 the price charged was $4 per 1,000 feet; from 1872 to 1877, $3; from 1877 to 1881, $2.75; from 1881 to 1883, $2.50; from 1883 to 1885, $2.25; from 1885 to 1888, $2. Prices then dropped rapidly to $1.80, $1.50, $1.25 and $1, until the consolidation was effected, when it was raised to $1.25. These prices have always been voluntarily reduced. The quality of the gas in the past two years has averaged 23-candle power. Gas for fuel is very popular in the city, hundreds of gas stoves being now in use. The Aurora Electric Light and Power Company, formerly owned by L. O. Hill & Co., and that established by the C. C. Hinckley Company, is a consolidation—the stock being owned by the same parties who control the stock of the Aurora Gas Light Company—with the same Board of Directors and the same officers. Both arc and incandescent lamps are furnished, and the rates charged are 30 per cent. lower than in corresponding cities of Illinois. The Superintendent of this division is Mr. Edward Wilcox, and the equipment is first-class throughout. The dynamos are driven by both steam and water power, the latter being derived from the wheels in the Stolp woolen mill. The steam power plant is located in a substantial brick building, on Water street, south of Fox street, and consists of one Hazelton upright boiler of 225-horse power capacity; two Westinghouse engines (one compound condensing) of 100 and 50-horse power, respectively. The dynamo equipment consists of three Brush arc, one Thomson-Houston arc, and one Westinghouse incandescent machine. The Company is well managed and is more than self-sustaining."

THE property, franchises, etc., of the Rock (natural) Gas Company, of Louisville, which were recently put up at auction on account of the bondholders, was bid in by Colonel Durell, whose offer was $250,000.

AT the annual meeting of the Toledo (O.) Gas Light and Coke Company, the following Directors were elected: S. M. Young, H. S. Walbridge, Jos. K. Secor, J. M. Gloyd and A. L. Backus.

THE new machine shop for the Ball and Wood Company, Elizabeth, N. J., is fast approaching completion. The building, which is of brick and iron, from designs furnished by the Berlin Iron Bridge Company, of East Berlin, Conn., and which is being built by the same Company, is 40 feet wide in the center, with two wings, each 20 feet in width. The entire central portion of the building will be served by a traveling crane, driven by electricity. This promises to be one of the most complete machine shops in the Eastern States.

THE Hennin Process Company has been incorporated at Birkner, St. Clair County, Ills., for the "manufacture of gas, coal tar and ammonia." It is capitalized in $50,000. This place is 4 miles west of Belleville, and is on the old St. Louis and Southeastern Railroad. A very fair quality of coal is mined at this point.

THE East Orange (N. J.) Township Committee has determined to accept the bid of the Gas Company for the public lighting for another year. The Company agrees to maintain gas lamps at the rate of $22 per annum each, to put in 6 additional high-power Bray burner lanterns (three of these were in use last year) and to lay mains wheresoever the Town Committee may direct.

THE consolidation between the gas and electric lighting interests of Jamaica, L. I., has been completed. The Gas Company takes over all the lighting contracts assumed by the Electric Light Company.

IT is said that 10,400 electric lights will be employed in lighting the public buildings, Broad street square, Philadelphia. Over 30 miles of copper wire will be used and 10 miles of conduit tubing has been laid.

THE Rhode Island Legislature has voted to indefinitely postpone consideration of the Columbian Land Grant bill, under which Mr. Addicks and his associates sought to capture the entire gas business of the State.

A 15-HORSE power gas engine has been set up in one of the mills of the Amoskeag Company's works at Manchester, N. H.

THE New Bedford (Mass.) Gas Light Company has contracted with the United Gas Improvement Company, of Philadelphia, for a double set of water gas apparatus, the same to have a total per diem capacity of 300,000 cubic feet. The plant is to be completed by October 1st.

THE Brookline (Mass.) Gas Light Company has declared a semi-annual dividend of 3½ per cent., payable July 15th.

THE following officers were chosen by the Directors of the Kenton (O.) Gas and Electric Light Company: President, J. M. White; Vice-President, Thos. Espy; Treasurer, L. Merriman; Secretary, W. S. Robinson.

EDWARD POWERS sued the Boston Gas Light Company, before Judge Hammond and a jury, for damages in the sum of $15,000, for personal injuries. Complainant averred that, on December 6, 1888, while in the pursuance of his duties as an inspector in the employ of the Boston Steam Heating Company, he was severely injured by an explosion of gas which had escaped from defendant's mains, the latter being in a state of bad repair. Defendant, through Mr. C. P. Greenough, interposed a general denial. The jury brought in a verdict for defendant, assessing the damages at $1,500

The Market for Gas Securities.

Consolidated sold off during the week to 95, ex-dividend, and there is little reported in the line of transferring. The shares are, in our opinion, at a very low price. To show in what light the stock is held as a safe investment by those whose duty it is to invest the surplus of fire insurance companies doing business in the State of New York, we might mention that, according to the New York Fire Insurance Report, Part I., for the year ending December 31st, 1890, the various fire companies held no less than $396,000 of Consolidated Company's stock. And we are credibly informed that $1,500,000 worth of it is held by the life insurance companies. Both Equitable and Mutual were inquired after during the week, at an advance in the bid rate of two points.

Over in Brooklyn the situation seems to have settled down to a complete acceptance of the $1.25 rate, and investors are rather reassured at their position. The Metropolitan Company has cut its dividend to 5 per cent. per annum, a shrinkage of 1 per cent., but this very conservative course more than anything else has contributed to a renewed confidence that the companies can more than live at the low gas figure just inaugurated. Old Brooklyn, at the offering price of 100, looks tempting. Chicago gas is strong, at or about 55, and it is a purchase even at the quotations. The St. Louis bungle has driven Laclede down to 13¾ and 14, and it may go lower. Mr. Thompson and his friends have had their day, and they will have it again, too—as they should.

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NOTICE.

American Gas Light Association.

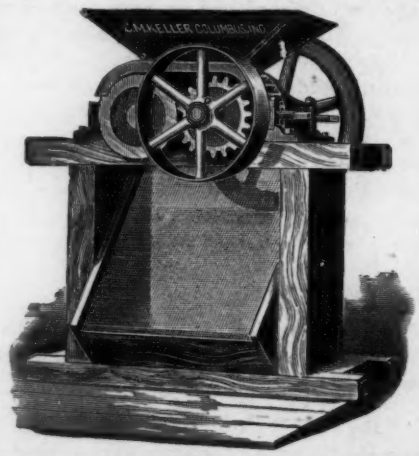
SECRETARY'S OFFICE,
LAWRENCE, MASS., June 1, 1891.

To the Members of the Association:

I am instructed by the Council to inform the members that at the October meeting Section 51 of the Constitution, which reads as follows: "No member who owes two years' dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the Proceedings"—will be strictly enforced.

The following committee was appointed to nominate officers for next year: E. G. Cowdery (Chairman), A. C. Humphreys, C. W. Blodgett, Thomas Turner, and A. B. Slater, Jr.

C. J. R. HUMPHREYS, Sec.



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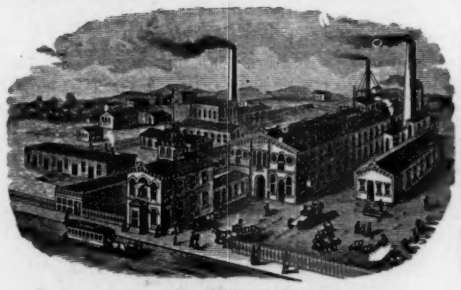

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The ordinary Steam Engine requires constant attention, largely from two causes: 1st. Because its design (not admitting of self-lubrication) must have all parts lubricated by hand many times daily; 2d. Because the DOUBLE-ACTING principle MUST loosen the parts. This is only a question of time. If the Engine be well built, more time; if carelessly built, less time; the result, however, is inevitable. It is a question of principle and not of workmanship. Imagine the shock produced by reversing the full power at every stroke. Just think how this shock is aggravated when the Engine is speeded up! The blow is equal to that of a steam hammer, and MUST loosen the parts.

The low initial speed of the ordinary Engine necessitates "speeding-up," as it is called, in driving all machinery that runs even at ordinary speeds. This "speeding-up" process involves an outlay for shafting, hangers, pulleys, belting, etc., often equal to the cost of the Engine itself! It costs at least $5.00 per year to lubricate each additional bearing. It costs the fuel necessary to drive all this useless, expensive and non-productive machinery, bought and run for the sole purpose of obtaining requisite speeds.

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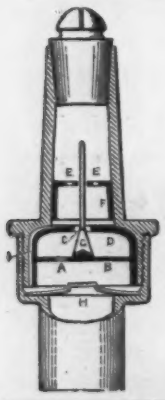

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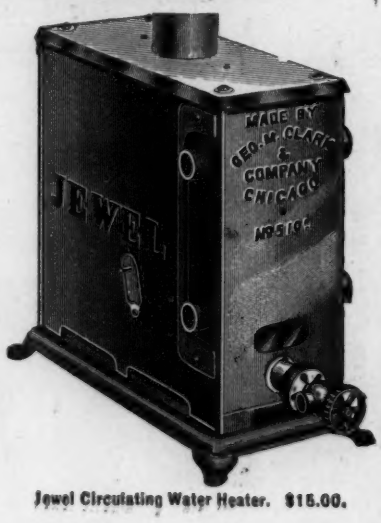

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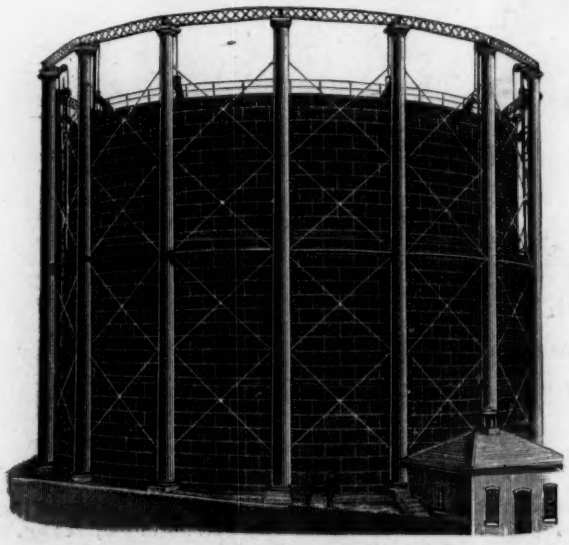

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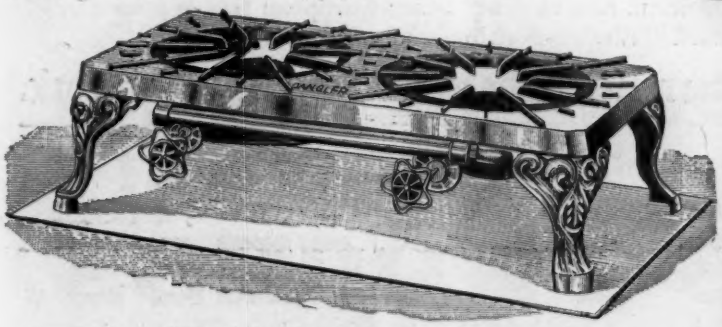

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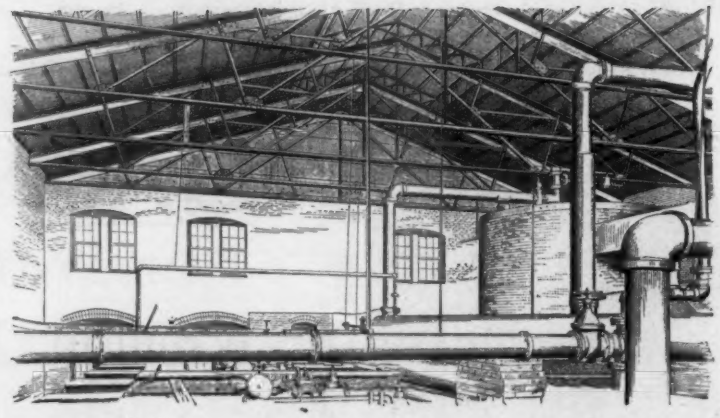

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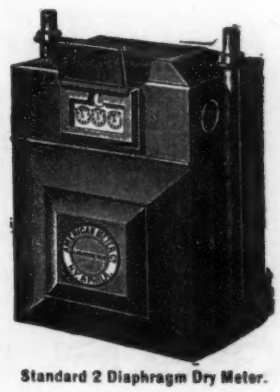

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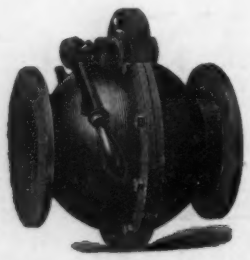

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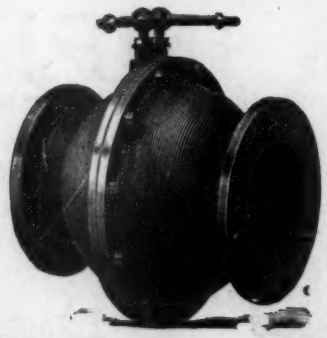

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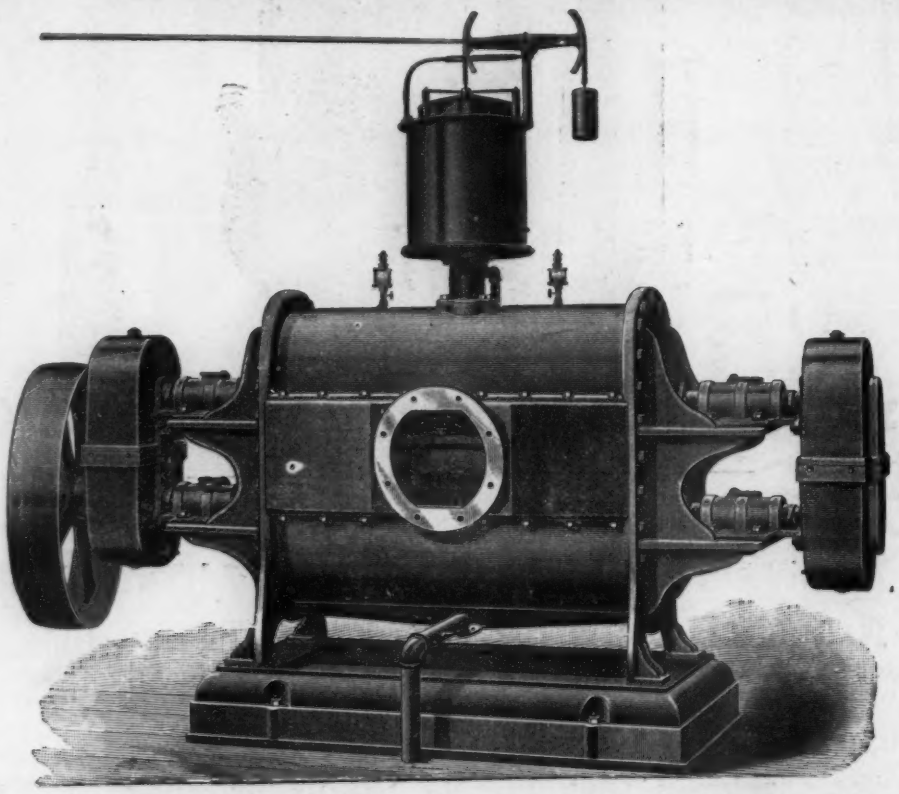

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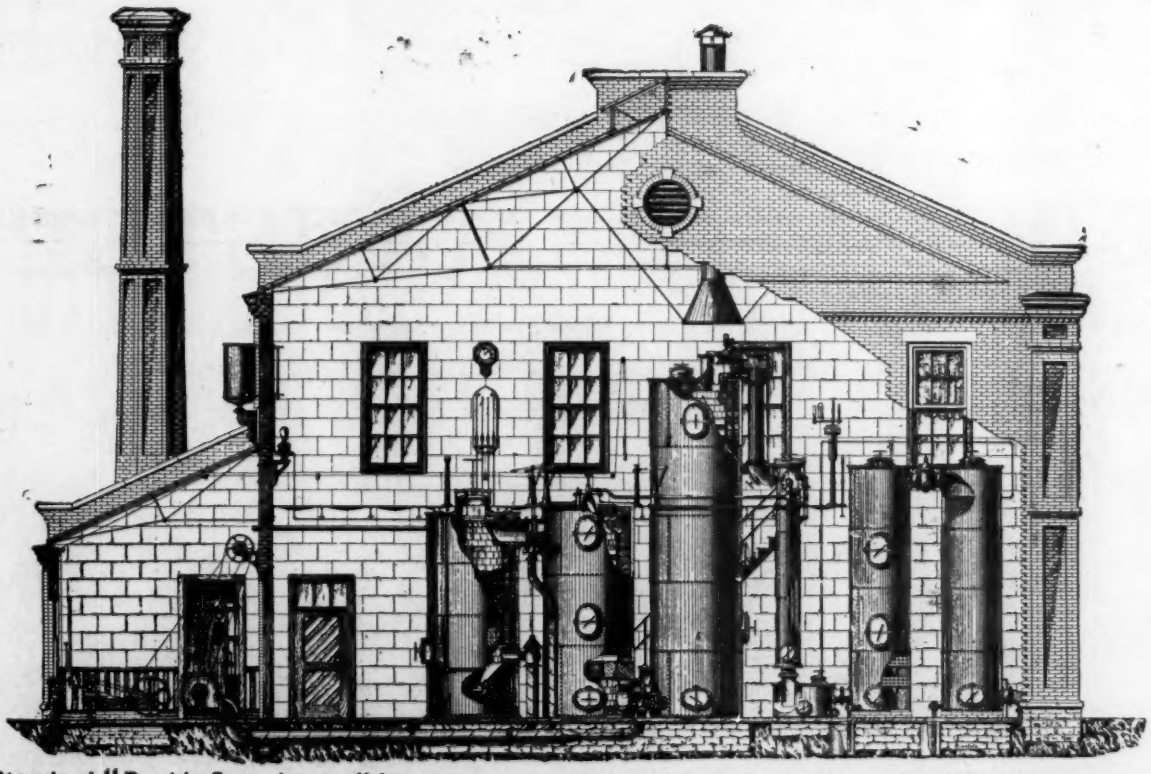

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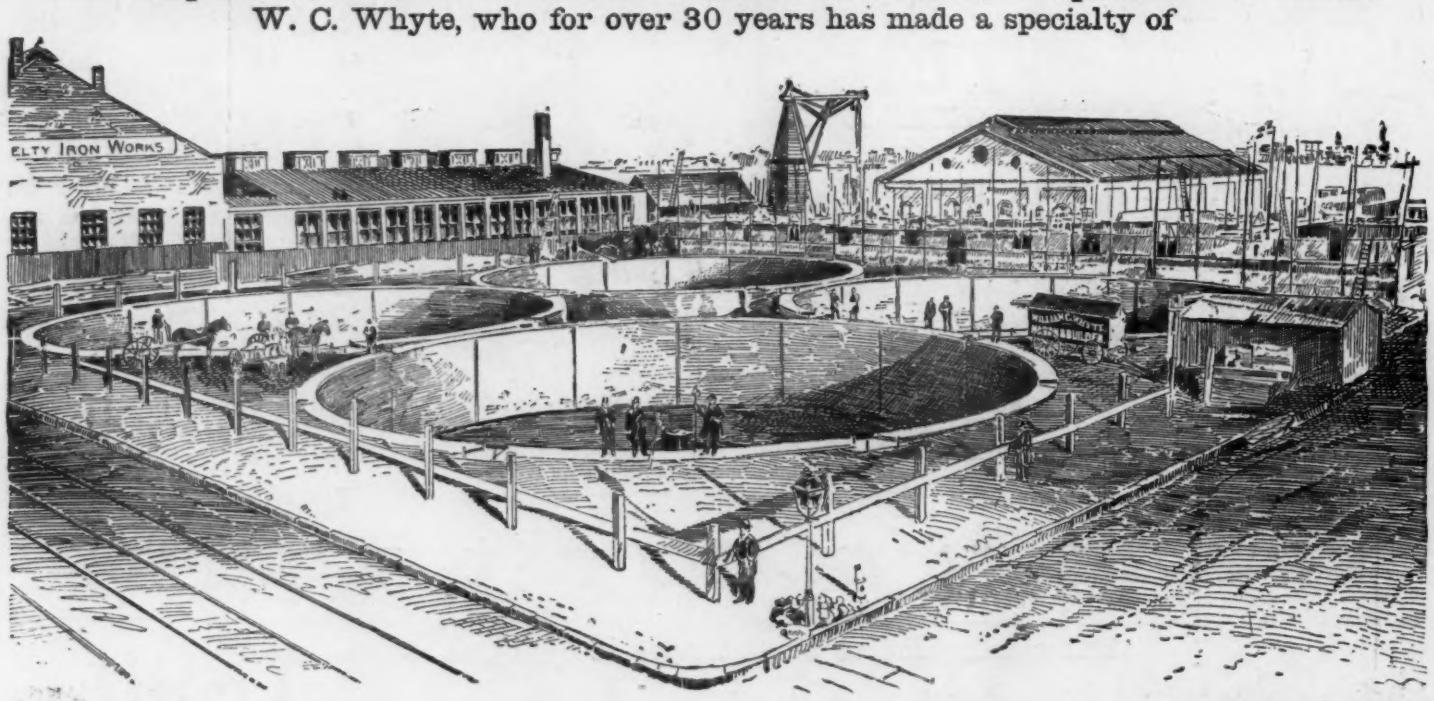

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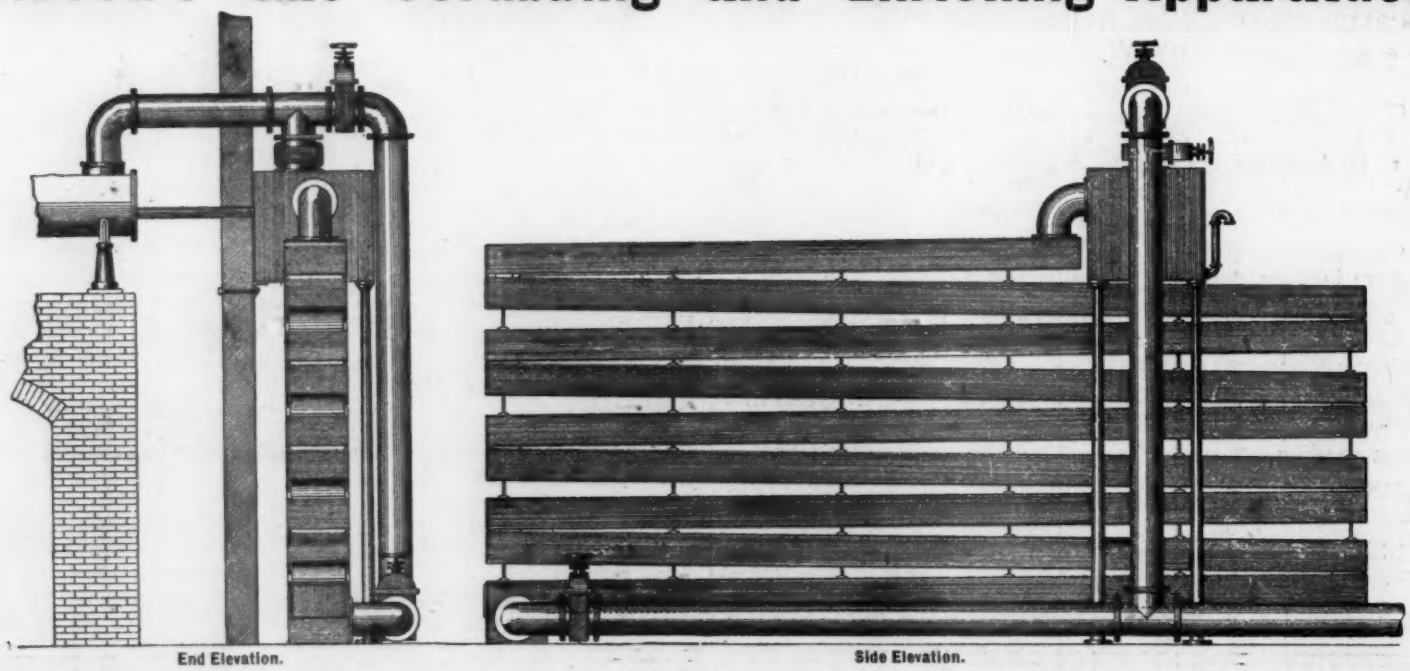

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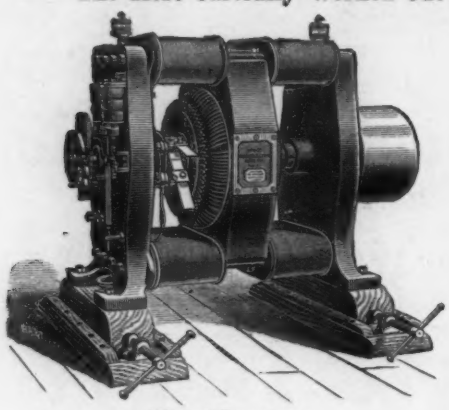

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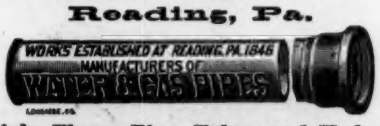

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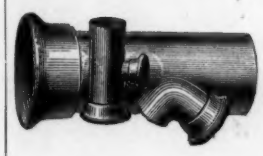

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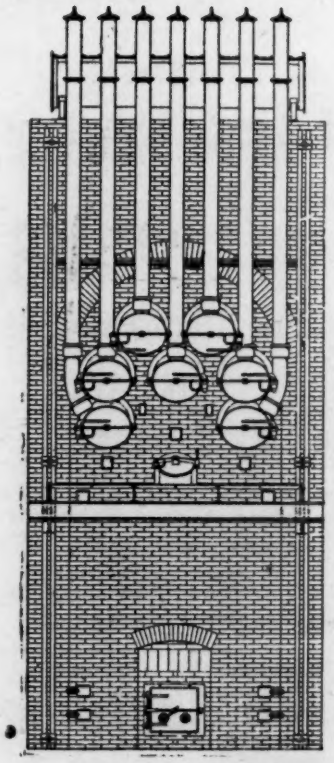

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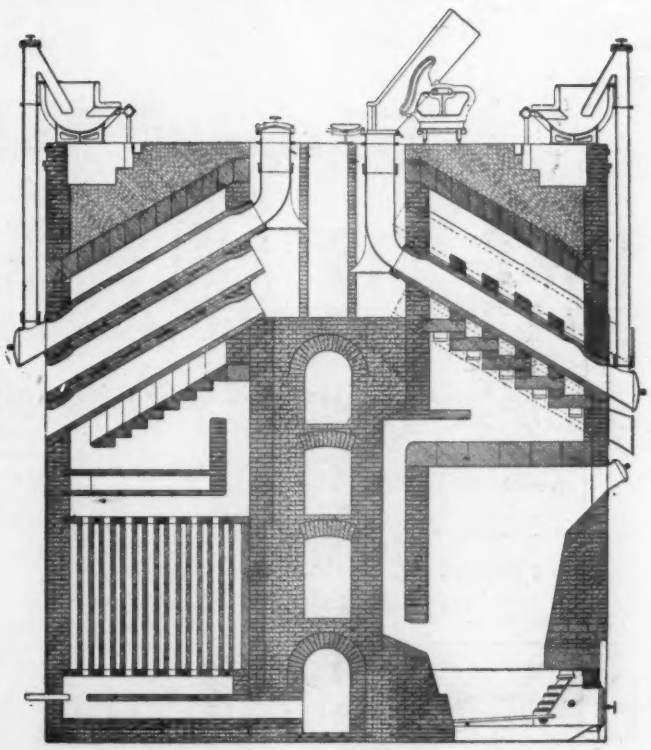

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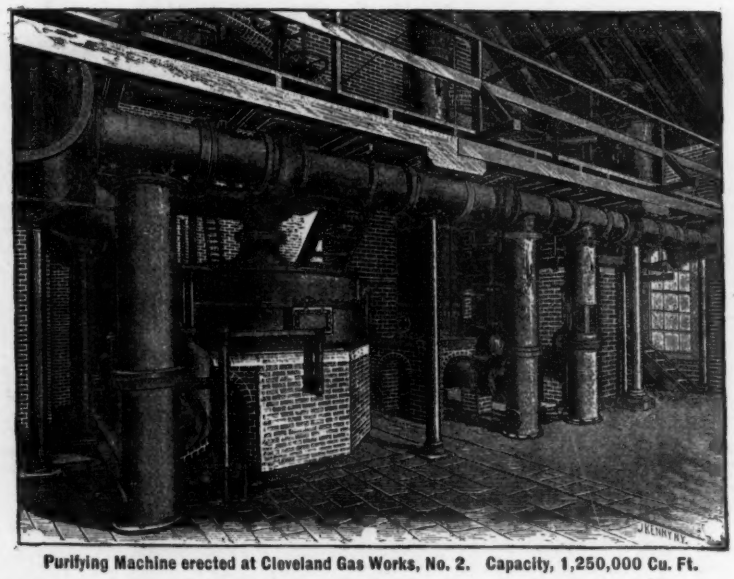

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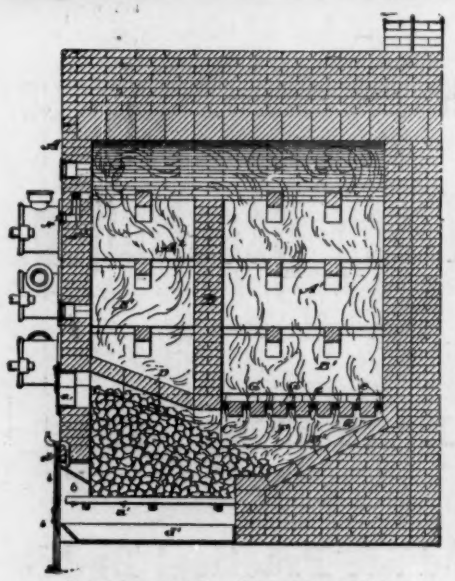

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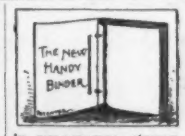

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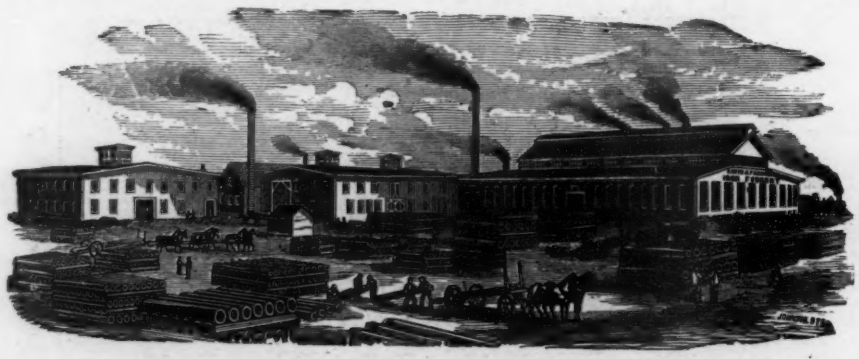

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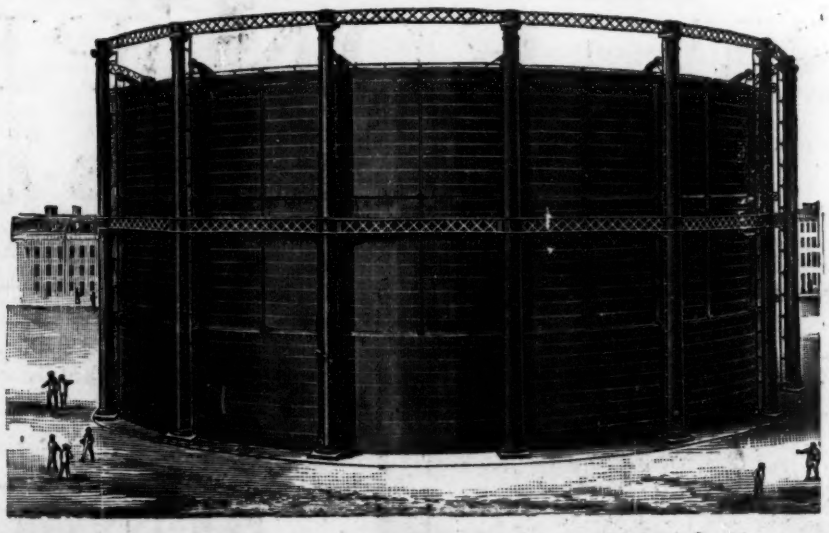

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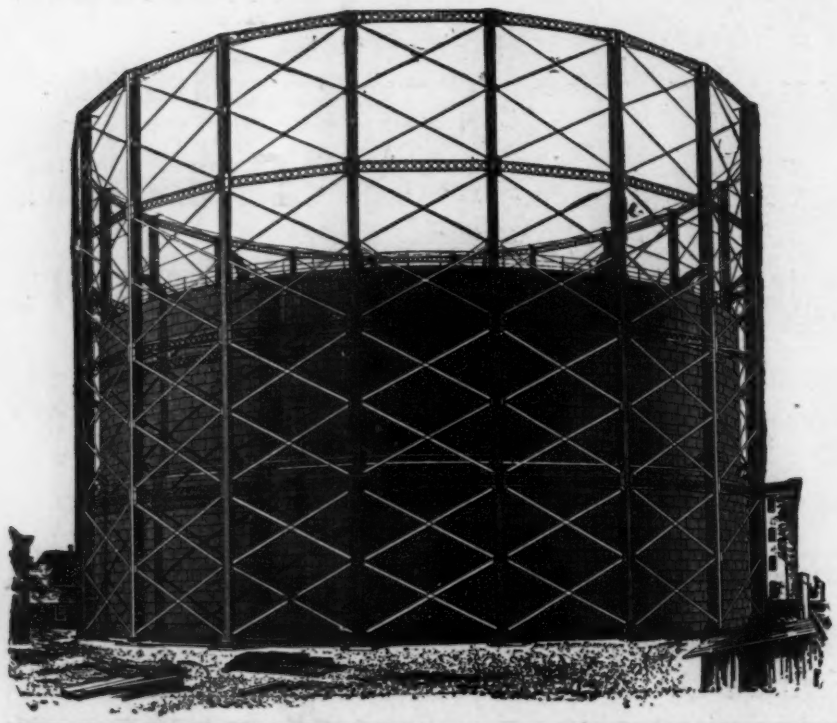

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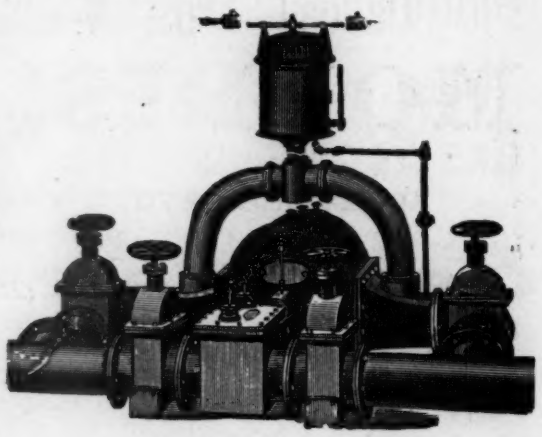

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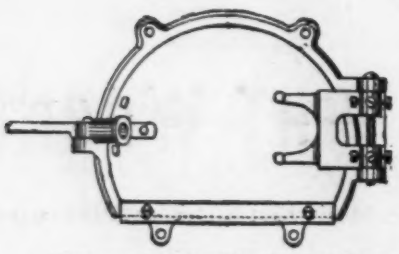

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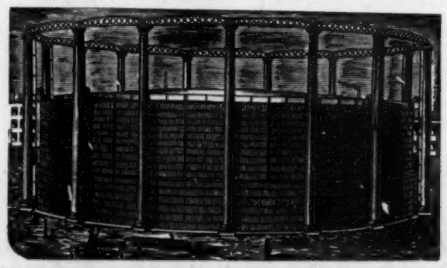

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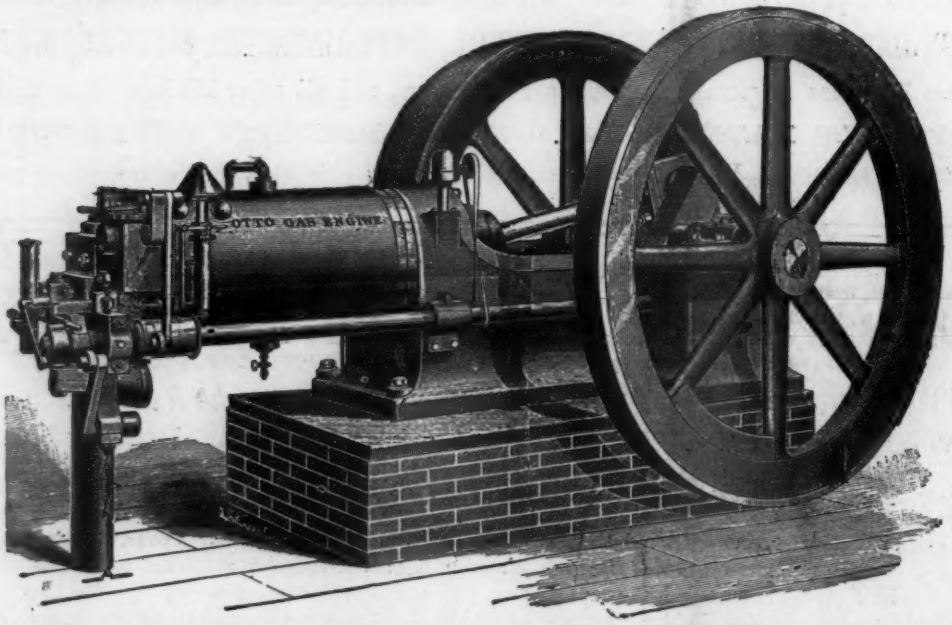

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